



TUBE HANDBOOK

ALL TYPES

This HANDBOOK of data on all RCA tubes has been compiled to meet the requirements of electronic engineers for tube information which can be kept up-to-date. Its convenient, loose-leaf form permits the revision of data on existing tubes and the addition of data on new tubes as they are made available.

The material is arranged in sections with tabbed separators to facilitate quick reference. The general section contains a table of contents for the complete Handbook, a detailed explanation of tube ratings and typical operating conditions, tube outline drawings, base drawings, and other useful information concerning tubes. The other sections, indexed according to tube classes, contain ratings, characteristics, operating conditions, and curves for the many different tubes in those classes.

The RCA Tube Handbook is especially useful to designers of tube equipment but will prove helpful to anyone having need for concise data on our various tubes. If further data on any tube type are desired, we shall be glad to be of assistance.

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA TUBE HANDBOOK HB-3

GENERAL SECTION



The information in this section, in general, applies to all classes of RCA tubes. It includes the Index of Contents for all sections, preferred-type lists, discussion of ratings, drawings of bases, caps, and tubes, as well as other general information of interest to the equipment designer.

*For further Technical Information, write to
Commercial Engineering, Tube Department,
Radio Corporation of America, Harrison, N. J.*

NOTICE

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Commercial Engineering
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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The TABLE OF CONTENTS and INDEX OF TUBE TYPES may be used to determine:

- (1) location of individual data sheets
- (2) completeness of Handbook
- (3) arrangement of Handbook sheets

Reference is to front of sheet only unless otherwise indicated. Date appearing on sheet is identified by month and year only (i.e., 2-56).

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C = CATHODE RAY P = PHOTOTUBE
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" Indicates that data for this type follow data for another type on same sheet.

* Type is approaching obsolescence. Not recommended for new equipment design.

• Discontinued type. Data retained in Handbook for reference purposes only.

Reference is to front of sheet only unless otherwise indicated. Date appearing on sheet is identified by month and year only (i.e., 2-56).

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14E7

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12AX4-GTA.	"	DATA, 3-55 (On 12AX4-GT sheet)	12SF5,		
12AX7.....	R	DATA, 11-54	12SF5-GT*	"	DATA, 9-49 (On 12S8-GT sheet)
	R	CURVE 92CM-6879	12SF7*....	"	DATA, 9-49 (On back of 12S8-GT sheet)
12AY7.....	M	TENT. DATA, 4-53	12SG7.....	"	DATA, 9-49 (On back of 12S8-GT sheet)
	M	CURVE 92CM-7861	12SH7.....	"	DATA, 9-49 (On back of 12S8-GT sheet)
12AZ7*....	R	TENT. DATA, 5-55	12SJ7,		
12B4-A....	R	TENT. DATA, 5-55	12SJ7-GT*	"	DATA, 9-49 (On back of 12S8-GT sheet)
12BA6.....	R	DATA, 11-52	12SK7,		
12BA7.....	"	DATA, 11-52 (On 12BA6 sheet)	12SK7-GT*	R	DATA, 3-55
12BD6*....	"	DATA, 11-52 (On 12BA6 sheet)	12SL7-GT..	"	DATA, 3-55 (On 12SK7 sheet)
12BE6.....	"	DATA, 11-52 (On 12BA6 sheet)	12SN7-GT..	"	DATA, 3-55 (On 12SK7 sheet)
12BF6.....	"	DATA, 11-52 (On 12BA6 sheet)	12SQ7,		
12BH7*....	R	DATA, 3-55	12SQ7-GT.	"	DATA, 3-55 (On 12SK7 sheet)
12BH7-A...	R	TENT. DATA 1, 3-55	12SR7.....	"	DATA, 3-55 (On 12SK7 sheet)
	R	TENT. DATA 2, 3-55	12SW7*....	M	TENT. DATA, 6-46
12BQ6-GTB/12CU6....	R	DATA, 3-55	12SX7-GT*	M	TENT. DATA, 6-46
12BY7*....	R	TENT. DATA, 6-54		M	CURVE 92CM-6782
12BY7-A....	R	DATA, 3-55	12SY7*....	M	TENT. DATA, 6-46
12C8*....	R	DATA, 3-55		M	CURVE 92CM-6786
12CA5.....	R	TENT. DATA, 3-55	12V6-GT...	"	DATA, 3-55 (On back of 12SK7 sheet)
	R	CURVE 92CM-8507	12W6-GT...	"	DATA, 3-55 (On back of 12SK7 sheet)
12CU6.....		See 12BQ6-GTB/12CU6	12X4.....	"	DATA, 3-55 (On back of 12SK7 sheet)
12DP7-A...	C	DATA, 11-55	14A4*....	R	DATA, 12-47
	C	OUTLINE CE-6375R6	14A5*....	"	DATA, 12-47 (On 14A4 sheet)
12DP7-B...	C	DATA, 11-55	14A7*....	"	DATA, 12-47 (On back of 14A4 sheet)
12H6.....	R	DATA, 3-55	14AF7*....	R	DATA, 11-48
12J5-GT*	"	DATA, 3-55 (On 12H6 sheet)	14B6*....	"	DATA, 11-48 (On back of 14AF7 sheet)
12J7-GT*	"	DATA, 3-55 (On 12H6 sheet)	14B8*....	"	DATA, 11-48 (On back of 14AF7 sheet)
12K7-GT*	"	DATA, 3-55 (On back of 12H6 sheet)	14C5*....	"	DATA, 11-48 (On back of 14AF7 sheet)
12K8*....	"	DATA, 3-55 (On back of 12H6 sheet)	14C7*....	R	DATA, 11-48
12KP4-A*..	C	TENT. DATA, 8-51	14CP4.....		See 14BP4/14CP4
	C	OUTLINE CE-7630	14E6*....	"	DATA, 11-48 (On back of 14C7 sheet)
12L6-GT...	"	DATA, 3-55 (On back of 12H6 sheet)	14E7*....	"	DATA, 11-48 (On back of 14C7 sheet)
12L8-GT*..	M	DATA, 10-43			
12LP4-A*..	C	DATA, 5-50			
	C	OUTLINE CE-7276R2			
	C	CURVE 92CM-7453			
12Q7-GT*..	"	DATA, 3-55 (On back of 12H6 sheet)			
12S8-GT*..	R	DATA, 9-49			
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	C	TENT. DATA 2, 2-56	17BP4-A*...	C	DATA, 2-56
	C	OUTLINE CE-8877B	17BP4-B*...	C	TENT. DATA 1, 2-56
	C	CURVE 92CM-8859		C	TENT. DATA 2, 2-56
14F7*.....	"	DATA, 11-48 (On back of 14C7 sheet)		C	OUTLINE CE-8879B
14F8*.....	"	DATA, 11-48 (On back of 14C7 sheet)	17CP4*....	C	CURVE 92CM-8861
14H7*.....	"	DATA, 11-48 (On back of 14C7 sheet)		C	TENT. DATA, 1-51
14HP4.....	C	TENT. DATA 1, 11-54		C	REFERENCE-LINE GAUGE CE-7391
	C	TENT. DATA 2, 11-54		C	OUTLINE CE-7535B
	C	OUTLINE CE-8335R1B		C	CURVE 92CM-7533
	C	CURVE 92CM-8392	17GP4*....	C	TENT. DATA 1, 5-51
14J7*.....	R	DATA, 5-50		C	TENT. DATA 2, 5-51
14N7*.....	"	DATA, 5-50 (On 14J7 sheet)		C	OUTLINE CE-7601B
14Q7*.....	"	DATA, 5-50 (On 14J7 sheet)	17HP4/ 17RP4*...	C	CURVE 92CM-7606
14R7*.....	"	DATA, 5-50 (On 14J7 sheet)		C	DATA, 2-56
15GP22*...	C	TENT. DATA 1, 3-54		C	TENT. DATA 1, 2-56
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16ADP7....	C	TENT. DATA, 2-52		C	CURVE 92CL-8862
	C	OUTLINE CE-7690	17JP4*....	C	TENT. DATA, 7-52
16AP4-A*...	C	DATA, 5-50		C	CURVE 92CM-7753
	C	OUTLINE CE-7449A		C	OUTLINE CE-7745R2B
	C	CURVE 92CM-7471		C	CURVE 92CM-7652R1
16DP4-A*...	C	TENT. DATA, 2-52	17LP4/ 17VP4*...	C	DATA, 2-56
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16KP4-A...		See 16RP4-A/16IP4-A	17QP4*....	C	TENT. DATA 1, 7-52
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16FP4-A/ 16KP4-A*	C	TENT. DATA 1, 2-56		C	CURVE 92CM-7755
	C	TENT. DATA 2, 2-56	17QP4-A*...	C	TENT. DATA 1, 2-56
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16TP4*....	C	TENT. DATA 1, 8-51	17RP4.....	C	TENT. DATA 1, 10-51
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	C	DRAWING CE-7908	105.....	F	TENT. DATA, 5-46
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	C	CURVE 92CM-7902	117M7-GT*	R	TENT. DATA, 5-41
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42*.....	R	DATA, 4-38		T	CURVE 92CM-5551
43*.....	R	DATA, 6-37	211*.....	T	DATA 1, 5-50
45*.....	R	DATA, 4-38		T	DATA 2, 5-50
47*.....	R	DATA, 11-37		T	CURVE 92CM-4537
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50C5.....	R	DATA, 1-55		F	CURVES CE-8610T-7072T1
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	S	CURVE 92CM-8592R1		T	CURVE 92CM-7078
	S	CURVE 92CM-8591R1	5AZP4....	C	TENT. DATA 1, 4-56
	S	CURVE 92CM-8589R1		C	TENT. DATA 2, 4-56
2N104.....	S	TENT. DATA 1, 6-56		C	NOTES CE-8556B
	S	TENT. DATA 2, 6-56	5CG8.....	R	DATA, 6-56
	S	TENT. DATA 3, 6-56	5FP15-A..	C	TENT. DATA, 10-56
	S	TRANSISTOR DISSIPATION RATING CHART, 92CM-8530R1		C	OUTLINE CE-9001R1
	S	CURVE 92CM-8512R1	5T8.....	R	DATA, 4-56
	S	CURVE 92CM-8534R1	6AU8.....	R	TENT. DATA 1, 4-56
	S	CURVE 92CM-8517R2		R	TENT. DATA 2, 4-56
	S	CURVE 92CM-8544R2		R	CURVE 92CM-8801R1
2N105.....	S	TENT. DATA 1, 6-56		R	CURVE 92CM-8803
	S	TENT. DATA 2, 6-56	6AV5-GA*.	R	TENT. DATA, 4-56
	S	CURVE 92CM-8572R1	6BH8.....	R	TENT. DATA 1, 4-56
	S	CURVE 92CM-8581R1		R	TENT. DATA 2, 4-56
	S	CURVE 92CM-8576R1		R	CURVE 92CM-8798R1
	S	CURVE 92CM-8573R1		R	CURVE 92CM-8800
2N109.....	S	TENT. DATA, 6-56	6BN4.....	R	TENT. DATA, 6-56
	S	CURVE 92CM-8599R2		R	CURVE 92CM-8933R1
	S	CURVE 92CM-8598R2	6BX7-GT..	R	TENT. DATA, 6-56
2N139.....	S	TENT. DATA, 6-56	6CB5-A...	R	TENT. DATA, 8-56
	S	CIRCUIT CE-8851R1		R	OUTLINE CE-8988R1
2N140.....	S	TENT. DATA, 6-56		R	CURVE 92CM-8437R1
	S	CIRCUIT CE-8850R1	6CD6-GA..	R	TENT. DATA, 10-56
2N175.....	S	TENT. DATA, 6-56		R	OUTLINE CE-9012
	S	CURVE 92CM-8914R1		R	CURVE 92CM-9016
2N215.....	S	DATA, 8-56	6CG8.....	R	TENT. DATA 1, 6-56
2N217.....	S	DATA, 8-56		R	TENT. DATA 2, 6-56
2N218.....	S	DATA, 10-56		R	CURVE 92CM-7532
2N219.....	S	DATA, 10-56		R	CURVE 92CM-7547R1
2N220.....	S	DATA, 10-56	6CH8.....	R	TENT. DATA 1, 6-56
3C23.....	F	DATA, 4-56		R	TENT. DATA 2, 6-56
	F	CURVE CE-6703T2		R	CURVE 92CM-8207
				R	CURVE 92CM-8208R1



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Tube Type	Section	Sheet & Date	Tube Type	Section	Sheet & Date	
6CS6.....	R	DATA, 8-56	21AXP22-A.	C	TENT. DATA 1, 8-56	
	R	CURVE 92CM-8922		C	TENT. DATA 2, 8-56	
6CU5.....	R	TENT. DATA, 4-56		C	TENT. DATA 3, 8-56	
	R	CURVE 92CM-8908R1		C	CUTOFF DESIGN CHART, 92CM-8565R1	
6DQ6-A....	R	TENT. DATA, 6-56		C	OUTLINE CE-8399R4B	
	R	OUTLINE CE-8937R1		C	GAUGE CE-8844B	
	R	CURVE 92CM-8953		C	CURVE 92CM-8426R3	
6DT6.....	R	TENT. DATA, 4-56	632-B.....	F	TENT. DATA, 8-56	
	R	CURVE 92CM-8827		F	CURVES CE-9008T-9007T	
	R	CURVE 92CM-9828	833-A.....	T	DATA 1, 10-56	
	R	CURVE 92CM-8826		T	DATA 2, 10-56	
6K6-GT....	R	DATA 1, 6-56		T	DATA 3, 10-56	
	R	DATA 2, 6-56		T	DATA 4, 10-56	
6T4*.....	R	TENT. DATA, 4-56		T	OUTLINE CE-4786R5	
6T8.....	R	DATA, 4-56		T	CURVE 92CM-6197	
8DP4.....	C	TENT. DATA 1, 10-56	917.....	P	DATA, 10-56	
	C	TENT. DATA 2, 10-56		P	CURVE 92CM-4360R2	
	C	TENT. DATA 3, 10-56	919.....	P	DATA, 10-56	
	C	OUTLINE CE-8876B	922.....	P	DATA, 10-56	
	C	CUTOFF DESIGN CHARTS CE-9110T-8886T1	5556.....	T	DATA 1, 10-56	
	C	CONTOUR DRAWING CE-8896B	5794.....	M	DATA, 4-56	
	C	CURVES CE-9116T-8888T	5819.....	P	DATA 1, 8-56	
12CR6.....	R	TENT. DATA, 6-56		P	DATA 2, 8-56	
	R	CURVE 92CM-9006		P	CURVE 92CM-8823	
12CU5.....	R	DATA, 4-56		P	CURVE 92CL-7258R4	
12DP7-A...	C	DATA, 10-56	6012.....	F	DATA 1, 4-56	
12DQ7-A...	R	DATA, 6-56		F	DATA 2, 4-56	
14RP4.....	C	TENT. DATA 1, 6-56		F	CURVE 92CM-7747	
	C	TENT. DATA 2, 6-56	6199.....	P	DATA 1, 8-56	
	C	TENT. DATA 3, 6-56		P	DATA 2, 8-56	
	C	OUTLINE CE-8942B		P	CURVE 92CM-7255R4	
	C	CUTOFF DESIGN CHART, 92CS-8972		P	CURVE 92CL-7812R1	
	C	CURVE 92CM-8995	6201.....	M	TENT. DATA 1, 10-56	
14RP4-A...	C	DATA, 6-56		M	TENT. DATA 2, 10-56	
17ATP4....	See 17AVP4/17ATP4			M	TENT. DATA 3, 10-56	
17ATP4-A...	See 17AVP4-A/17ATP4-A			M	TENT. DATA 4, 10-56	
17AVP4/				M	CURVE 92CM-9021	
17ATP4....	C	TENT. DATA 1, 10-56		M	CURVE 92CM-9022	
	C	TENT. DATA 2, 10-56	6211.....	M	DATA 1, 4-56	
	C	TENT. DATA 3, 10-56		M	DATA 2, 4-56	
	C	OUTLINE CE-8341R1B	6326-A....	C	TENT. DATA 1, 10-56	
	C	CURVE 92CM-8746R1		C	TENT. DATA 2, 10-56	
17AVP4-A/				C	CURVE 92CM-7783R1	
17ATP4-A.	C	DATA, 10-56	6499.....	C	CURVE 92CM-8110	
				C	TENT. DATA 1, 8-56	
				C	TENT. DATA 2, 8-56	
				C	OUTLINE CE-8891A	
				C	CURVE 92CM-8948	
				C	CURVE 92CL-8961	



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6524.....	T	DATA 1, 6-56	6810.....	P	TENT. DATA 1, 4-56
	T	DATA 4, 6-56		P	TENT. DATA 2, 4-56
	T	OUTLINE CE-8345R2A		P	OUTLINE CE-8802
6562.....	M	TENT. DATA, 4-56		P	CURVE 92CM-8848
	M	OUTLINE CE-8747	6850.....	T	DATA, 6-56
6655.....	P	DATA 1, 10-56	6861.....	M	TENT. DATA, 10-56
	P	DATA 2, 10-56		M	OUTLINE CE-8951
6694-A....	S	TENT. DATA, 4-56		M	CURVES CE-8971T-8969T
	S	CURVES 92CM-8583V1 & 92CM-8872V	6866.....	C	TENT. DATA 1, 10-56
	S	CURVE 92CM-8873		C	TENT. DATA 2, 10-56
6806.....	T	TENT. DATA 1, 8-56		C	TENT. DATA 3, 10-56
	T	TENT. DATA 2, 8-56		C	CURVE 92CM-9042
	T	TENT. DATA 3, 8-56		C	CURVE 92CM-9044
	T	CIRCUITS CE-8912		C	CURVE 92CM-9046
	T	OUTLINE CE-8840B	6883.....	T	DATA, 8-56
	T	NOTES CE-8840D	6893.....	T	DATA, 10-56
	T	GAUGE CE-8253R1	6903.....	P	TENT. DATA 1, 10-56
	T	CURVE 92CL-8901		P	TENT. DATA 2, 10-56
	T	CURVE 92CM-8899		P	CURVE 92CM-9039
	T	CURVE 92CM-8909		P	CURVE 92CL-9033
			8008.....	T	DATA, 8-56

DELETIONS

IN55-A....	S	TENT. DATA, 8-53	2N34.....	S	TENT. DATA, 6-53
IN56-A....	S	TENT. DATA, 8-53		S	CURVE 92CM-7962
2J50.....	M	TENT. DATA, 1-51	2N35.....	S	TENT. DATA, 6-53
	M	COUPLING CE-7509		S	CURVE 92CM-7959
	M	OUTLINE CE-7507B	6211.....	M	CURVE 92CM-7824R1
	M	CURVE 92CM-7511	6694.....	S	TENT. DATA, 7-55
2N32.....	S	TENT. DATA, 6-53		S	OUTLINE CE-8579
	S	OUTLINE CE-7970		S	CURVE 92CM-8584
2N33.....	S	TENT. DATA, 6-53		S	CURVE 92CM-8593

DISCONTINUED TYPES

The following tube types have been discontinued. To indicate this fact for your future reference, please place a large dot (●) after each of the types in the "Tube Type" column of the Index of Tube Types sheets.

1AC5	6AF4	6SN7-GTA	12BY7
1Q5-GT	6AU4-GT	6ST7	20CP4
1T6	6AV5-GT	12AX4-GT	71-A
5Y4-G	6SN7-GT	12BH7	6323



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**SUPPLEMENTARY
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Tube Type	Section	Sheet & Date	Tube Type	Section	Sheet & Date
1K3.....	R	TENT. DATA, 4-59	17AX4-GT.	R	DATA, 4-59
	R	OUTLINE CE-9889	17BQ6-GTB	"	DATA, 4-59 (On 17AX4-GT sheet)
1N1763...	S	TENT. DATA 1, 4-59	17DE4....	"	DATA, 4-59 (On 17AX4-GT sheet)
	S	TENT. DATA 2, 4-59	17DQ6-A..	"	DATA, 4-59 (On back of 17AX4-GT sheet)
	S	CURVES 92CS-9723 & 92CS-9720	21CXP4...	C	TENT. DATA 1, 4-59
	S	CURVE 92CS-9982		C	TENT. DATA 2, 4-59
1N1764...	S	TENT. DATA 1, 4-59		C	OUTLINE CE-9910B
	S	TENT. DATA 2, 4-59		C	RASTER-CUTOFF-RANGE CHART 92CS-9911
	S	CURVES 92CS-9722 & 92CS-9721		C	CURVE 92CM-9909
	S	CURVE 92CS-9988	21DAP4...	C	TENT. DATA 1, 4-59
3C45.....		See 8130/3045	21WP4....	C	TENT. DATA, 4-59
3CF6.....	R	DATA, 4-59	21WP4-A..	"	TENT. DATA, 4-59 (On 21WP4 sheet)
3CS6.....	"	DATA, 4-59 (On 3CF6 sheet)	21XP4-A..	C	TENT. DATA, 4-59
3DK6.....	"	DATA, 4-59 (On 3CF6 sheet)	24AUP4...	C	TENT. DATA 1, 4-59
3DT6.....	"	DATA, 4-59 (On back of 3CF6 sheet)		C	TENT. DATA 2, 4-59
5CG8.....	R	DATA, 4-59		C	RASTER-CUTOFF-RANGE CHARTS 92CS-9919 & 92CS-9918
5CL8-A...	"	DATA, 4-59 (On 5CG8 sheet)		C	OUTLINE CE-9917B
5CQ8.....	"	DATA, 4-59 (On 5CG8 sheet)		C	CURVE 92CM-9352
5CZ5.....	"	DATA, 4-59 (On back of 5CG8 sheet)	2020.....	P	TENT. DATA 1, 4-59
6BR8-A...	R	TENT. DATA, 4-59		P	TENT. DATA 2, 4-59
6CB6-A...	R	TENT. DATA, 4-59		P	CURVE 92CL-8641
	R	CURVE 92CM-9854		P	CURVE 92CM-8640
6CL8-A...	R	TENT. DATA 1, 4-59	5551-A...	F	TENT. DATA 1, 4-59
	R	TENT. DATA 2, 4-59		F	TENT. DATA 2, 4-59
6DE4.....	R	TENT. DATA, 4-59		F	TENT. DATA 3, 4-59
	R	CURVE 92CS-9884		F	RATING CHARTS 92CS-9695 & 92CS-9698
6DK6.....	R	TENT. DATA, 4-59		F	RATING CHART 92CM-9692
	R	CURVE 92CM-9851R1	5552-A...	F	TENT. DATA 1, 4-59
6EA8.....	R	TENT. DATA, 4-59		F	TENT. DATA 2, 4-59
	R	CURVE 92CM-9866		F	OUTLINE CE-9772R1A
	R	CURVE 92CM-9867		F	RATING CHART 92CM-9710
6T8-A...	R	TENT. DATA 1, 4-59	5553-B...	F	TENT. DATA 1, 4-59
	R	TENT. DATA 2, 4-59		F	TENT. DATA 2, 4-59
	R	CURVE 92CM-9611R1		F	OUTLINE CE-9838R1A
12AL8....	R	TENT. DATA, 4-59		F	RATING CHART 92CM-9822
	R	CURVE 92CM-9432		F	RATING CHARTS 92CS-9825 & 92CS-9824
	R	CURVE 92CM-9423	5642.....	D	TENT. DATA, 4-59
12CN5....	R	TENT. DATA, 4-59	5686.....	D	TENT. DATA 1, 4-59
12CX6....	R	TENT. DATA, 4-59		D	TENT. DATA 2, 4-59
12D4.....	R	TENT. DATA, 4-59	5687.....	D	TENT. DATA, 4-59
12J8.....	R	TENT. DATA, 4-59	5750.....	D	TENT. DATA 1, 4-59
12R5.....	R	TENT. DATA, 4-59		D	TENT. DATA 2, 4-59



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Tube Type	Section	Sheet & Date	Tube Type	Section	Sheet & Date
5822-A...	F	TENT. DATA 1, 4-59	7199.....	R	TENT. DATA 1, 4-59
	F	TENT. DATA 2, 4-59		R	TENT. DATA 2, 4-59
	F	OUTLINE & NOTES CE- 9772R1B & RATING CHART 92CS-9821		R	CURVE 92CM-9704
6130/3C45	F	DATA 1, 4-59		R	CURVES 92CS-9702 & 92CS-9703
	F	DATA 2, 4-59	7263.....	P	TENT. DATA 1, 4-59
7025.....	R	TENT. DATA, 4-59		P	TENT. DATA 2, 4-59
	R	CURVE 92CM-6879		P	TENT. DATA 3, 4-59
7038.....	P	DATA 1, 4-59		P	CURVE 92CM-9505
	P	DATA 2, 4-59		P	CURVE 92CM-9499
				P	CURVE 92CS-9493

DELETIONS					
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17BWP4...	C	DATA, 9-58	5553.....	F	TENT. DATA, 5-46
5551.....	F	TENT. DATA, 5-46	5822.....	F	TENT. DATA, 2-52
5552.....	F	DATA, 3-51			

DISCONTINUED TYPES

The following types have been discontinued. To indicate this fact for your future reference please place a large dot (●) after each of the types in the "Tube Type" column of the Index of Tube Types sheets.

1LC5

17BWP4

5553

5822



INFORMATION ON PRICES

Information as to the retail prices of RCA electron tubes and semiconductor devices described in this handbook may be obtained from your local RCA Tube Distributor. A list of RCA Tube Distributors in your locality will gladly be supplied upon request to Commercial Engineering, RCA, Harrison, N.J.

Equipment manufacturers desiring price information on electron devices for initial installation in equipment will gladly be supplied such information by an RCA Equipment Sales representative, who may be reached at the following RCA Equipment Sales Offices:

(East) 744 Broad Street
Newark 1, New Jersey
Humboldt 5-3900

(Central) Suite 1181
Merchandise Mart Plaza
Chicago 54, Illinois
Whitehall 4-2900

(West) 6355 E. Washington Blvd.
Los Angeles 22, California
Raymond 3-8361

EXPORT

*RCA International Division
Tube Department
Radio Corporation of America
30 Rockefeller Plaza
New York 20, N.Y. (U.S.A.)*

← Indicates a change.



RCA PREFERRED TUBE TYPES FOR NEW EQUIPMENT DESIGN

This list of Preferred Tube Types is presented to assist equipment manufacturers in formulating their plans for future production of electronic equipment. It is based on a careful survey of the needs of the engineering and manufacturing fields.

The soundness of the Preferred Tube Program, first introduced by RCA in January, 1940, has been proven with the passing years.

By using Preferred Tube Types, electronic-equipment manufacturers can reduce manufacturing costs for the following reasons:

- | | | |
|---|---|--|
| 1. LOWER INITIAL
COST OF TUBES | { | a. We can manufacture more efficiently for stock.
b. Our production rate on preferred types is more uniform because of smaller demand for other types. |
| 2. MORE PROFIT
THROUGH BETTER
DELIVERIES | { | a. Fewer tube types mean better deliveries and insure continuous production of electronic equipment. |
| 3. IMPROVED QUALITY
OF PRODUCT FROM
LONGER PRODUCTION
RUNS | { | a. Tube operator acquires more skill working on one type for a considerable length of time. Such skill results in better quality which means less cost to equipment manufacturers on their production line because of fewer stoppages. |
| 4. STANDARDIZATION
OF FEWER TUBE
TYPES | { | a. Permits standardizing fewer accessory parts, such as capacitors, resistors, etc.
b. Results in purchasing and stocking economies. |
| 5. CUSTOMER
SATISFACTION | { | a. Purchasers of electronic equipment equipped with Preferred Type Tubes will have greater satisfaction, we believe, because these fast-moving types can be regularly stocked and will, therefore, be easier to obtain for renewal purposes. |

This list, of course, is subject to change resulting from technological advances in tube design and application. When such changes become necessary, they will be incorporated in revised issues of this list.



RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

VACUUM TYPES FOR RF AND AF POWER APPLICATIONS								
<i>Values shown are Unmodulated Class C Ratings for Continuous Commercial Service</i>								
TYPE	CLASS	MAXIMUM INPUT POWER vs FREQUENCY						UNITS
		1.6	7.5	15	25	50	75	Mc
5763 [•]	Beam	15	15	15	15	15	15	watts
2E24 [•]	Beam	30	30	30	30	30	30	watts
2E26 [•]	Beam	30	30	30	30	30	30	watts
832-A [•]	Beam [□]	36	36	36	36	36	36	watts
807 [•]	Beam	60	60	60	60	50	40	watts
6146 [•]	Beam	67.5	67.5	67.5	67.5	67.5	63	watts
829-B [•]	Beam [□]	120	120	120	120	120	120	watts
812-A [•]	Triode	175	175	175	175	160	130	watts
811-A [•]	Triode	175	175	175	175	160	130	watts
8005 [•]	Triode	240	240	240	240	195	-	watts
4X150A	Tetrode	250	250	250	250	250	250	watts
813 [•]	Beam	360	360	360	360	300	-	watts
6161	Triode	400	400	400	400	400	400	watts
8000 [•]	Triode	500	500	500	500	400	300	watts
4-125A/ 4D21	Tetrode	500	500	500	500	500	500	watts
5786	Triode	1.5	1.5	1.5	1.5	1.5	1.5	kw
833-A [•]	Triode	1.8	1.8	1.8	1.75	1.5	1.2	kw
6181	Tetrode	2.5	2.5	2.5	2.5	2.5	2.5	kw
5762	Triode	8.7	8.7	8.7	8.7	8.3 [★]	7.9 [★]	kw
889R-A	Triode	16	16	16	16	12	9.6	kw
6166	Tetrode	18	18	18	18	17.8 [†]	17.7 [†]	kw
892	Triode	30	22.5	17	-	-	-	kw
5771	Triode	67.5	60	60	60	45	-	kw
5671	Triode	100	100	90	80	-	-	kw
5770	Triode	150	150	150	135	-	-	kw

□ Twin Type - Input values per tube for push-pull operation.

• Type may be operated at higher ratings in Intermittent Commercial and Amateur Service (ICAS) as given in published data for each type.

★ For Television Picture Service over the range of 54 Mc. to 216 Mc., the CCS maximum rated input power is 6.5 kw.

† For Television Picture Service over the range of 54 Mc. to 216 Mc., the CCS maximum rated input power is 22 kw.

THYRATRONS

2D21	5560
672-A	5563
2050	5696
6012	

IGNITRONS

5551
5552
5553
5822

RECTIFIERS[•]

2X2-A	857-B
3B28	866-A
5R4-GY	869-B
673	8008

• For additional vacuum-type rectifiers, see listing of types for Receiver Applications.



RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

VACUUM TYPES FOR RF AND AF POWER APPLICATIONS: (Cont'd)							
<i>Values shown are Unmodulated Class C Ratings for Continuous Commercial Service</i>							
UNITS	MAXIMUM INPUT POWER vs FREQUENCY					CLASS	TYPE
	110	175	220	450	900		
Mc							
watts	15	15	—	—	—	Beam	5763 [•]
watts	30	20	—	—	—	Beam	2E24 [•]
watts	30	20	—	—	—	Beam	2E26 [•]
watts	36	36	34	—	—	Beam [□]	832-A [•]
watts	—	—	—	—	—	Beam	807 [•]
watts	56	47	—	—	—	Beam	6146 [•]
watts	120	120	114	—	—	Beam [□]	829-B [•]
watts	—	—	—	—	—	Triode	812-A [•]
watts	—	—	—	—	—	Triode	811-A [•]
watts	—	—	—	—	—	Triode	8005 [•]
watts	250	250	250	250	—	Tetrode	4X150A
watts	—	—	—	—	—	Beam	813 [•]
watts	400	400	400	400	400	Triode	6161
watts	—	—	—	—	—	Triode	8000 [•]
watts	500	470	390	—	—	Tetrode	4-125A/ 4D21
kw	1.5	1.5	—	—	—	Triode	5786
kw	—	—	—	—	—	Triode	833-A [•]
kw	2.5	2.5	2.5	2.5	2.5	Tetrode	6181
kw	7.3 [*]	6.1 [*]	4.5 [*]	—	—	Triode	5762
kw	—	—	—	—	—	Triode	889R-A
kw	17.2†	16.5†	16	—	—	Tetrode	6166
kw	—	—	—	—	—	Triode	892
kw	—	—	—	—	—	Triode	5771
kw	—	—	—	—	—	Triode	5671
kw	—	—	—	—	—	Triode	5770

SMALL TYPES FOR INDUSTRIAL AND COMMUNICATION SERVICES

HOME ENTERTAINMENT TYPES OF SPECIAL INTEREST*	VACUUM TYPES FOR CRITICAL APPLICATIONS		TYPES FOR REGULATOR SERVICE	GLOW DISCHARGE TRIODE
6AX6	6L6-G	1620	0A2	5823
6AQ6	6SC7	5690	0B2	
6BJ6	6SL7-GT	5691	5651	
6C4	12AX7 [▲]	5692	6080	
		5693		
		5879		

* Also see types for AM, FM, & TV Receivers.

▲ Tapped heater, for 6.3-volt or 12.6-volt operation.



RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

TYPES FOR AM AND FM BROADCAST RECEIVER APPLICATIONS

RECTIFIERS and DIODE DETECTORS	CONVERTERS	AMPLIFIERS, OSCILLATORS, & MIXERS					OUTPUT AMPLIFIERS
		Triodes		Pentodes			
		Twin	With Diodes	Sharp Cutoff	Remote Cutoff	With Diode	
5U4-G 5Y3-GT 6AL5 6X4 35W4	1R5 6BE6 6X8 12BE6	 12AU7 [▲]	 6AV6 12AV6	1U4 6AU6 6CB6	1T4 6BA6 12BA6	1U5 35C5 50C5	3S4 3V4 6AQ5 6K6-GT 6V6-GT

TYPES FOR TELEVISION RECEIVER APPLICATIONS

RF TUNER TUBES	AMPLIFIERS				DEFLECTION OSCILLATORS	SOUND & VIDEO DETECTOR
	IF	Video	Audio	Deflection		
<i>6AF4</i> [*] <i>6BQ7-A</i> [*] <i>6J6</i> <i>6X8</i>	6AU6 <i>6BQ7-A</i> 6CB6	6AU6 6CL6	<i>6AQ5</i> <i>6AV6</i> 6K6-GT 6V6-GT	<i>6S4</i> 6BQ6-GT 6CD6-G 6W6-GT	6SN7-GT <i>12AU7</i> [▲] <i>12BH7</i> [▲]	<i>6AL5</i>

RECTIFIERS		DAMPER TUBE	CONTROL CIRCUITS [⊛]
High- Voltage	Low- Voltage		
1B3-GT	5U4-G	6AX4-GT 6W4-GT	<i>6AU6</i> 6SN7-GT <i>12AU7</i> [▲] <i>12BH7</i> [▲]

* For UHF.

▲ Tapped heater, for 6.3-volt or 12.6-volt operation.

⊛ Including synchronizing functions, AGC, etc.



RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

C-R OSCILLOGRAPH TYPES

P1 SCREEN	P7 SCREEN	P11 SCREEN	P14 SCREEN	P16 SCREEN
2BP1 3JP1* 3RP1* 5ABP1 5UP1	3JP7* 5ABP7* 5FP7-A 5UP7 7MP7 10KP7 12SP7 16ADP7	2BP11 3KP11 5ABP11* 5UP11 5WP11†	5FP14 7MP14	5ZP16‡

† Transcriber Type ‡ Flying-Spot Type
* Post-Deflection Accelerator Type

PHOTOTUBES

SINGLE-UNIT		MULTIPLIER
S1 Response	S4 Response	S4 Response
1P40 921 922 927	1P39	931-A 5819 6199

CAMERA AND TV STUDIO TYPES

5820	Image Orthicon
6198	Vidicon [□]
2F21	Monoscope

□ Industrial Type



RCA TUBE TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN

Certain tube types should be avoided in the design of new equipment because they are approaching obsolescence or have limited or dwindling demand. Such RCA types are listed below for the benefit of equipment designers.

RECEIVING TUBE TYPES

0Z4-G	6A8-G	6K7-G	12A8-GT	42
1A5-GT	6A8-GT	6K7-GT	12AH7-GT	43
1C5-GT	6AB5/6N5	6N7	12J5-GT	45
1D8-GT	6AB7	6Q7	12J7-GT	47
1G6-GT	6AC5-GT	6Q7-GT	12K7-GT	56
1LA4	6AF6-G	6R7	12Q7-GT	57
1Q5-GT	6B8	6S7	12SK7-GT	58
1S4	6C6	6SA7-GT	14B8	70L7-GT
1T5-GT	6C8-G	6SB7-Y	14C5	71-A
1-v	6D6	6SF7	14H7	75
5T4	6F5	6SK7-GT	24-A	76
5W4-GT	6F5-GT	6SQ7-GT	25A6	77
5X4-G	6F6-G	6SS7	25W4-GT	78
5Y3-G	6F7	6ST7	25Z5	80
5Y4-G	6G6-G	6SZ7	25Z6	83-v
5Z3	6H6-GT	6U5	26	84/6Z4
6A3	6J7-GT	6U7-G	27	117N7-GT
6A7	6J8-G	6X5	35Z4-GT	117P7-GT
6A8	6K7	7E7	41	117Z6-GT

TRANSMITTING TUBE TYPES

10-Y	801-A	842	861	1619
203-A	803	843	862-A	1623
207	804	846	865	1624
211	830-B	849	893-A	1626
217-C	838	851	893A-R	8012-A
800	841	860	898-A	

CATHODE-RAY TUBE TYPES

2AP1-A	10FP4-A	16KP4	16TP4	905-A
3AP1-A	12KP4-A	16LP4-A	16WP4-A	908-A
3KP4	14CP4	16RP4	902-A	913
5BP1-A	16DP4-A			

(continued on next page)



RCA TUBE TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN

PHOTOTUBES

923 924

THYRATRONS

629 885

MISCELLANEOUS

2A4-G	2V3-G	874
2C21/1642	559	878
2C22	864	1634



INTERCHANGEABILITY LIST

**POWER TUBES, RECTIFIER TUBES, THYRATRONS,
IGNITRONS, VOLTAGE REGULATORS, PHOTOTUBES,
CATHODE-RAY TUBES, AND SPECIAL TYPES**

Direct Replacement Types*			
Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
0A3/VR75	0A3	RK-25B	802
0C3/VR105	0C3	CE-28(A-D)	928
0D3/VR150	0D3	RK-28	803
CE-1(A-D)	868, 918	RK28A	803
1P32	927	CE-29(A-D)	929, 1P39
2AP1	2AP1-A	CE-30(A-D)	930, 1P40
2B4	885	CE-30V	925
ML-381	2C39-A	RK-30	800
3X100A11	2C39-A	FG-32	5558
ZP572	2C39-A	CE-34	934
2X2/879	2X2-A	RK-39	807
3-50G2	834	CE-41	921
3AP1	3AP1-A	CE-42	922
3BP1	3BP1-A	RK-44	837
3C45	6130/3C45	RK-47	814
3D22	3D22-A	UH-50	834
4D21	4-125A/4D21	R51A	927
4-250A	4-250A/5D22	CE-55	924
4-400A	4-250A/5D22	FG-57	5559
5BP1	5BP1-A	RK-57	805
5CP1	5CP1-A	RK-58	838
5CP7	5CP7-A	CE-59	5581
5D22	4-250A/5D22	R59A	868, 918
5FP7	5FP7-A	R60A	920
5HP1-A	5BP1-A*	HY-61/807	807
7BP7	7BP7-A	R61A	930
PJ-8	5556	CE-64	5583
G9	868	FG-67	5728/FG-67
BW-11	834	VR75-30	0A3
CE-11V(A-D)	917	FG-95	5560
RK-11	1623	CE-98	5582
12DP7	12DP7-A	FG-104	5561
FG-17	5557	VR105-30	0C3
CE-20	927	HF120	211
RK-20A	804	VR150-30	0D3
CE-21(A-D)	920	WT-210-0001	2D21
CE-23(A-D)	923	WT-210-0003	884
PJ-23	868	WT-210-0004	2050
CE-25(A-D)	927	WT-210-0006	6H6
RK-25	802	WT-210-0008	866-A

* RCA types are direct replacements under all circumstances.

• Direct replacement, except in high-altitude service.



INTERCHANGEABILITY LIST

Direct Replacement Types* (Cont'd)			
Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
WT-210-0009	84/6Z4	WT-210-0084	6N7-GT
WT-210-0011	0C3	WT-210-0085	50B5
WT-210-0012	80	WT-210-0086	833-A
WT-210-0013	5Z3	WT-210-0087	6K8-GT
WT-210-0015	5557	WT-210-0088	6J5-GT
WT-210-0018	0D3	WT-210-0089	6G6-G
WT-210-0019	83	WT-210-0090	6C6
WT-210-0021	6X5	WT-210-0091	0A4-G
WT-210-0025	117Z6-GT	211-D	211
WT-210-0027	872-A	FG-235A	5552
WT-210-0028	305-GT	FG-238B	5555
WT-210-0029	6C5	242A	211
WT-210-0031	902-A	242B	211
WT-210-0037	117L7-GT/ 117M7-GT	WT-245	884
		WT-246	2050
WT-210-0038	172	FG-258A	5553
WT-210-0040	6X4	FG-259B	5554
WT-210-0042	5Y3-GT	WT-261	6H6
WT-210-0044	575-A	WE-261A	835
WT-210-0045	892	WT-262	866-A
WT-210-0048	5U4-G	WT-263	6Z4
WT-210-0052	2AP1-A	WT-269	0C3
WT-210-0053	3AP1-A	WT-270	80
WT-210-0056	5559	WT-270X	5Z3
WT-210-0057	5560	FG-271	5551
WT-210-0058	676	WT-272	5557
WT-210-0060	0Z4	WE-274B	5R4-GY
WT-210-0061	117N7-GT	WT-294	0D3
WT-210-0062	5557	WE-295A	203-A
WT-210-0069	5557	WT-301	83
WT-210-0070	5550	UE-303A	203-A
WT-210-0071	5551	WE-304B	834
WT-210-0072	5552	F-307A	207
WT-210-0073	5553	WT-308	6X5-GT
WT-210-0074	105	CE-309	5557
WT-210-0078	172	CE-311	3C23
WT-210-0079	105	UE-311	211
WT-210-0081	6SJ7	UE-311C	835
WT-210-0082	6V6	UE-317C	217-C
WT-210-0083	7K7	WE-322A	803

* RCA types are direct replacements under all circumstances.



INTERCHANGEABILITY LIST

Direct Replacement Types* (Cont'd)			
Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
WE-350A	807	872	872-A
375-A	575-A	872-A/872	872-A
WT-377	117Z6-GT	F-872B	872-A
ML-381	2C39-A	879	2X2-A
WT-389	3Q5-GT	889	889-A
WT-390	6C5	893	893-A
FJ-401	1P29	902	902-A
WE-403A	6AK5	UE-905	805
GL-415	5550	905	905-A
GL-451	8020	906-P1	3AP1-A
ZP-572	2C39-A	908	908-A
WT-606	2D21	914	914-A
WL-630	2050	931	931-A
WL-631	5559	UE-938	838
KU-634	677	UE-949	849
WL-651/656	5552	UE-966A	866-A
WL-652/657	5551	UE-967	5557
WL-653B	5555	UE-972A	872-A
WL-655/658	5553	UE-975A	575-A
672	672-A	1640	6405/1640
678	5563-A	1802-P1	58P1-A
WL-679	5554	1811-P1	7CP1
WL-681/686	5550	1849	1850-A
NL-715	5557	1850	1850-A
ML-728	5557	1854	6474/1854
WL-735	868	1904	5728/FG-67
801	801-A	2051	2050
811	811-A	2525A5	58P1-A
812	812-A	5604	5604-A
829	829-B	5814	5814-A
829-A	829-B	8001	4E27/8001
832	832-A	8016	1B3-GT
833	833-A	WTT-100	6X4
C-833	833-A	WTT-102	5Y3-GT
UH-50	834	WTT-103	6H6
857	857-B	WTT-104	575-A
862	862-A	WTT-105	892
866	866-A	WTT-111	5559
866-A/866	866-A	WTT-112	5560
869-A	869-B	WTT-113	676

* RCA types are direct replacements under all circumstances.



INTERCHANGEABILITY LIST

Direct Replacement Types* (Cont'd)			
Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
WTT-114	0Z4	WTT-127	833-A
WTT-115	117N7-GT	WTT-128	6K8-GT
WTT-117	5557	WTT-129	6J5-GT
WTT-118	105	WTT-130	6G6-G
WTT-119	172	WTT-131	6C6
WTT-122	6SJ7	WTT-132	0A4-G
WTT-123	6V6	WTT-135	5U4-G
WTT-124	7K7	WTT-136	2AP1-A
WTT-125	6N7-GT	WTT-137	3AP1-A
WTT-126	50B5	WTT-139	172
Similar Types#			
Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
CE-1V(A-D)	930, 1P40	4X150G	4X150A
CE-2(A-D)	917, 919	CE5(A-D)	927
2B22	559	5C24	8000
2C38	2C39-A	5D24	4-250A/5D22
2E25	2E24	6D22	4X500A
2E30	5618	WT-6	6L6
3B27	836	7C20	5762/7C24
3B28	866-A	7C25	5762/7C24
3C21	838	7C27	5762/7C24
3C24	1623	HV-12	806
3-25A3	809	RK-12	809
3-50A4	811-A	CE-13	868
3-75A3	8005	CE-13V	917
3-250A4	806	G-15F	927
3-450A4	833-A	HV-18	806
3-1000A2	8000	FV-20	8000
3-1000A4	810	T-20	1623
3X2500A3	5762/7C24	TV-20	810
4C21	211	TZ-20	809
4C22	8005	PJ-21	5556

* RCA types are direct replacements under all circumstances.

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.



INTERCHANGEABILITY LIST

Similar Types# (Cont'd)			
Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
CE-22(A-D)	1P41	HY-57	812-A
PJ-22	917	R-58A	927
X-22	1616	58AWB	927
KU-23	806	59D	929
RK-23	802	CE-60	917
RK-23A	802	HF-60	8005
24-G	808	HY-60	807
HY-25	809	SK-60	868
25T	809	T-60	8005
RK-27	806	R61BV	929
FG-27A	5559	RK-63	806
HY-30Z	809	SK-63	918
CE-31V	919	RK-64	807
FG-33	5728/FG-67	R64AV	925
35T	811-A	HY-69	1624
35TG	808	V-70-D	8005
CE-36(A-D)	927	R71A	930, 1P40
RK-36	806	R71AV	925
RK-37	808	71D	929
RK-38	806	FP-85	8020
HY-40	812-A	FP-85A	8020
T-40	812-A	R85A	928
TZ-40	811-A	CE-91R	1P37
HY-40Z	811-A	HF-100	8005
RK-41	807	100R	8020
RK-46	804	100TH	810
RK87	814	100TL	8000
RK-48A	813	111-H	812-A
SR-50	917	ZB-120	838
HY-51A	830-B	F123A	806
HY-51B	830-B	HF-125	8005
HY-51Z	838	T-125	810
RK-51	830-B	F-127A	810
SR-51	926	F-128A	851
RK-52	811-A	HF-130	835
53AWB	927	HF-140	211
SR-53	917	143D	2X2-A
HK-54	808	GL-146	805
54-XH	3AP1-A	AB-150	845
T-55	8005	TW-150	810

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.



INTERCHANGEABILITY LIST

Similar Types# (Cont'd)			
Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
150P	803	HK-254	810
150T	806	WE-254B	865
152TH	806	WE-255B	869-B
152TL	806	HF-258B	866-A
GL-152	805	WE-259A	24-A
HK-154	808	260A	860
T-155	806	HF-261A	835
C-200	810	WE-264A	864
HF-200	8000	WE-264B, C	864
T-200	806	266B	857-B
C-201	805	WE-266C	857-B
C-202	805	WE-267B	872-A
HD-203A	805	WE-268A	801-A
HD-203C	805	WE-271A	843
HF-203H	8003	WE-274A	5R4-GY
WE-205D	10-Y	WE-281A	46
WE-205E	10-Y	T-282A	8000
WT-210-0007	6L6	WE-284B	845
WT-210-0067	3C23	WE-284D	845
211B	211	WE-287A	5557
211C	835	WE-298A	862-A
HD-211C	805	300	806
211E	835	WE-301A	83
212E	849	T-303C	8000
WE-214E	217-C	UE-303U	8000
WE-217-A	80	UE-304A	204-A
WE-220C	892	WE-304B	6AK5
Z-225	866-A	CE-306	676
WE-231D	864	WE-307A	807
WE-241B	833-A	UE-310	801-A
WE-242C	211	WE-310A	6C6
T-249B	866-A	UE-311CH	8000
WE-249A	866-A	UE-311T	8003
WE-249B	866-A	UE-311CT	8003
250TH	810	WE-312A	828
250TL	806	315A	673
HF-250	8000	319A	872-A
WE-251A	851	321A	673
WE-252A	842	323B	3C23
HK-253	217-C	WE-339A	807

* RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.



INTERCHANGEABILITY LIST

Similar Types# (Cont'd)			
Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
WE-341AA	891-R	678	5563-A
F-342A	858	NL-710	676
343A	858	NL-714	5557
WE-348A	1620	WL-734	917
C-350	807	WL-739	927
WE-350B	807	WL-741	923
353A	872-A	T-756	809
HK-354C	806	UE-812H	8005
HK-354D	806	T-814	806
HK-354E	806	T-822	806
HK-354F	806	825	1623
ML-356	5771	C-849A	833-A
WE-356A	808	C-849H	833-A
WE-357A	833-A	F-857A	857-B
F-357A	857-B	861-A	861
WE-359A	1C21	863	892
WE-361A	835	866-B	866-A
F-363A	892	C-872	872-A
F-367A	673	UE-911CH	835
F-369B	869-B	UE-942	842
F-376A	835	NL-1005	5551
WE-393A	3C23	1603	1620, 5879
WE-394A	627	1816-P4A	10FP4-A
WE-395A	5823	1847	5527
FJ-405	935	1851	6AC7
WL-450	833-A	1899	2F21
WL-460	806	2501-A3	3AP1-A
WL-463	806	2501-C3	908-A
UE-468	8000	5514	811-A
WL-468	810	5516	2E24
WL-471	8003	5591	6AK5
WL-473	5762/7C24	5604	889R-A
WL-481	8013-A	5606	892
RH-507	1949	5654	6AK5
DRJ-524	864	5658	880
GL-546	5696	5663	5696
578	8020	5666	889-A
NL-615	5558	5667	889R-A
WL-632A	5560	5668	892
WL-632B	5560	5669	892-R

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.



INTERCHANGEABILITY LIST

Similar Types# (Cont'd)			
Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
5685/C6J	676	6336	6080
5686	5763	6346	5551
5695	816	6347	5552
5720/FG-33	5728/FG-67	6348	5553
5725	6AS6	6394	6082
5736	5726/7C24	6445	892-R
5788	5555	6446	892
5891	5671	6447	892-R
5918	5770	6626	6073
5934	579-B	6627	6074
5959	6130/3C45	AX9911	6130/3C45
6140/423A	5651		
6155	4D21/4-125A		
6156	4-250A/5D22		
6333	892		

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.



RATING SYSTEMS

for Electron Devices

Three Rating Systems are in use by the Electron-Device Industry. The oldest is known as the Absolute-Maximum System, the next as the Design-Center System, and the latest and newest is the Design-Maximum System. Definitions of these systems have been formulated by the Joint Electron Tube Engineering Council (JETEC)—now identified as the Joint Electron Device Engineering Council (JEDEC)—and standardized by National Electrical Manufacturers Association (NEMA) and Electronic Industries Association (EIA) as follows:

Absolute-Maximum Rating System

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment-component variation, equipment-control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

Design-Center Rating System

Design-Center ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply-voltage variation*, equipment-component variation, equipment-control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

The equipment manufacturer should design so that initially no Design-Center value for the intended service is exceeded with a bogey device in equipment operating at the stated normal supply voltage*.

* For an ac power source, 117 volts plus or minus 10 per cent is accepted USA practice.



RATING SYSTEMS

for Electron Devices

Design-Maximum Rating System

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Design-Maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment-component variation, equipment-control adjustment, load variation, signal variation, and environmental conditions.

Differences Between Systems

The significant differences between the three Rating Systems can be summarized as follows:

Absolute-Maximum System:

$$\text{Ratings} = \left[\begin{array}{c} \text{Maximum capa-} \\ \text{bilities of} \\ \text{any electron} \\ \text{device of the} \\ \text{type rated} \end{array} \right]$$

Design-Center System:

$$\text{Ratings} = \left[\begin{array}{c} \text{Maximum capa-} \\ \text{bilities of} \\ \text{any electron} \\ \text{device of the} \\ \text{type rated} \end{array} \right] - \left[\begin{array}{c} \text{Allow-} \\ \text{ance for} \\ \text{electron-} \\ \text{device} \\ \text{variations} \end{array} \right] - \left[\begin{array}{c} \text{Allowance} \\ \text{for} \\ \text{component} \\ \text{and supply} \\ \text{variations} \end{array} \right]$$

Design-Maximum System:

$$\text{Ratings} = \left[\begin{array}{c} \text{Maximum capa-} \\ \text{bilities of} \\ \text{any electron} \\ \text{device of the} \\ \text{type rated} \end{array} \right] - \left[\begin{array}{c} \text{Allow-} \\ \text{ance for} \\ \text{electron-} \\ \text{device} \\ \text{variations} \end{array} \right]$$



TUBE RATINGS

AND THEIR SIGNIFICANCE

A rating is a designation, as established by definite standards, of an operating limit of a tube. Tubes are rated by either of two systems, i.e., the "absolute maximum" system or the "design-center maximum" system. Of the two, the absolute maximum system is the older and dates back to the beginning of tubes. With either system, each maximum rating for a given tube type must be considered in relation to all other maximum ratings for that type, so that no one maximum rating will be exceeded in utilizing any other maximum rating. For convenience in referring to these two systems, the former will hereinafter be called the "absolute system," and the latter, the "design-center system."

In the **absolute system**,* the maximum ratings shown for each type thus rated are limiting values above which the serviceability of the tube may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by an amount such that the absolute values will never be exceeded under any usual condition of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

The equipment should be designed to operate the filament or heater of each tube type at rated normal value for full-load operating conditions under average voltage-supply conditions. Variations from this normal value due to voltage-supply fluctuation or other causes, should not exceed ± 5 per cent unless otherwise specified by the tube manufacturer.

* Types rated according to the **absolute system** have no identification on their data pages issued prior to April 1, 1942. Sheets issued after that date carry the statement "Maximum Ratings Are Absolute Values" preceding the ratings.



TUBE RATINGS

(continued from preceding page)

In the design-center system** adopted by the receiving-tube industry late in 1939, the maximum ratings shown for each type thus rated are working design-center maximums. The basic purpose underlying this system is to provide satisfactory average performance in the greatest number of equipments on the premise that they will not be adjusted to local power-supply conditions at time of installation. In the setting up of design-center ratings, consideration has been given to three important kinds of power supply commonly in use, i.e., a-c and d-c power lines, storage battery with connected charger, and dry batteries.

In the case of a-c or d-c power lines, the maximum ratings for tubes rated according to the design-center system have been chosen so that the tubes will give satisfactory performance at these maximum ratings in equipment operated from power-line supplies whose normal voltage including normal variations fall within ± 10 per cent of a specified center value. In other words, it is basic to the design-center system of ratings for tubes operated from power-line supplies that filaments or heaters as well as positive- and negative-potential electrodes may have to operate at voltages differing as much as ± 10 per cent from their rated values. It also recognizes that equipment may occasionally be used on power-line supplies outside the normal range, but since such extreme cases are the exception, they should be handled by adjustment made locally.

The choice of ± 10 per cent takes care of voltage differences in power lines in the U.S.A. where surveys have shown that the voltages delivered fall within ± 10 per cent of 117 volts. Therefore, satisfactory performance from tubes rated according to the design-center system will ordinarily be obtained

** Types rated according to the design-center system are identified on their data pages either by a large star in the index corner or by the statement "Maximum Ratings Are Design-Center Values" preceding the ratings. This statement is used on sheets issued since April 1, 1942.



TUBE RATINGS

(continued from preceding page)

anywhere in the U.S.A. in equipment designed so that the design-center maximum ratings are not exceeded at a line-voltage-center value of 117 volts. While 117 volts represents present-day conditions, the design-center system permits the utilization of a new line-center value as new surveys may indicate the necessity for such a change.

In the case of storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. This fluctuation imposes severe operating conditions on tubes. Under these conditions, latitude for operation of tubes is provided for by the stipulation that only 90 per cent of the design-center maximum values of plate voltages, screen-supply voltages, dissipations, and rectifier output currents is never exceeded for a terminal potential at the battery source of 2.2 volts per cell. While a tube's operating voltages in this service will at times exceed the maximum values, satisfactory performance with probable sacrifice in life will be obtained.

In the cases of dry-battery supply and rectified a-c supply for 1.4-volt tubes, recommended design practice is given in RMA Standard M8-210.

RMA Standard M8-210 (Jan. 8, 1940 Rev. 11-40) is reproduced here for the convenient reference of design engineers with permission of the Engineering Department of the Radio Manufacturers Association. Although worded to cover only receiving tubes, it can be applied to any tube having design-center-system ratings.

* * *

It shall be standard to interpret the ratings on receiving types of tubes according to the following conditions:

1. CATHODE—The heater or filament voltage is given as a normal value unless otherwise stated. This means that transformers or resistances in the heater or filament circuit should be designed to op-



TUBE RATINGS

(continued from preceding page)

erate the heater or filament at rated value for full-load operating conditions under average supply-voltage conditions. A reasonable amount of leeway is incorporated in the cathode design so that moderate fluctuations of heater or filament voltage downward will not cause marked falling off in response; also, moderate voltage fluctuations upward will not reduce the life of the cathode to an unsatisfactory degree.

A. 1.4-Volt Battery Tube Types—The filament power supply may be obtained from dry-cell batteries, from storage batteries, or from a power line. With dry-cell battery supply, the filament may be connected either directly across a battery rated at a terminal potential of 1.5 volts, or in series with the filaments of similar tubes across a power supply consisting of dry cells in series. In either case, the voltage across each 1.4-volt section of filament should not exceed 1.6 volts. With power-line or storage-battery supply, the filament may be operated in series with the filaments of similar tubes. For such operation, design adjustments should be made so that, with tubes of rated characteristics, operating with all electrode voltages applied and on a normal line voltage of 117 volts or on a normal storage-battery voltage of 2.0 volts per cell (without a charger) or 2.2 volts per cell (with a charger), the voltage drop across each 1.4-volt section of filament will be maintained within a range of 1.25 to 1.4 volts with a nominal center of 1.3 volts. In order to meet the recommended conditions for operating filaments in series from dry-battery, storage-battery, or power-line sources it may be necessary to use shunting resistors across the individual 1.4-volt sections of filament.

B. 2.0-Volt Battery Tube Types—The 2.0-volt line of tubes is designed to be operated with 2.0 volts across the filament. In all cases the operat-



TUBE RATINGS

(continued from preceding page)

ing voltage range should be maintained within the limits of 1.8 volts to 2.2 volts.

2. POSITIVE POTENTIAL ELECTRODES—The power sources for the operation of radio equipment are subject to variations in their terminal potential. Consequently, the maximum ratings shown on the tube-type data sheets have been established for certain Design Center Voltages which experience has shown to be representative. The Design Center Voltages to be used for the various power supplies together with other rating considerations are as given below:

A. AC or DC Power Line Service in U.S.A.—The design center voltage for this type of power supply is 117 volts. The maximum ratings of plate voltages, screen-supply voltages, dissipations, and rectifier output currents are design maximums and should not be exceeded in equipment operated at a line voltage of 117 volts.

B. Storage-Battery Service—When storage-battery equipment is operated without a charger, it should be designed so that the published maximum values of plate voltages, screen-supply voltages, dissipations, and rectifier output currents are never exceeded for a terminal potential at the battery source of 2.0 volts per cell. When storage-battery equipment is operated with a charger, it should be designed so that 90 % of the same maximum values is never exceeded for a terminal potential at the battery source of 2.2 volts.

C. "B"-Battery Service—The design center voltage for "B" batteries is the normal voltage rating of the battery block, such as 45 volts, 90 volts, etc. Equipment should be designed so that under no condition of battery voltage will the plate voltages, the screen-supply voltages, or dissipations ever exceed the recommended respective maximum values shown in the data for each tube type by more than 10 %.



TUBE RATINGS

(continued from preceding page)

D. Other Considerations

a. Class A₁ Amplifiers—The maximum plate dissipation occurs at the "Zero-Signal" condition. The maximum screen dissipation usually occurs at the condition where the peak-input signal voltage is equal to the bias voltage.

b. Class B Amplifiers—The maximum plate dissipation theoretically occurs at approximately 63% of the "Maximum-Signal" condition, but practically may occur at any signal voltage value.

c. Converters—The maximum plate dissipation occurs at the "Zero-Signal" condition and the frequency at which the oscillator-developed bias is a minimum. The screen dissipation for any reasonable variation in signal voltage must never exceed the rated value by more than 10%.

d. Screen Ratings—When the screen voltage is supplied through a series voltage-dropping resistor, the maximum screen voltage rating may be exceeded, provided the maximum screen dissipation rating is not exceeded at any signal condition, and the maximum screen voltage rating is not exceeded at the maximum-signal condition. Provided these conditions are fulfilled, the screen-supply voltage may be as high as, but not above, the maximum plate voltage rating.

3. TYPICAL OPERATION — For many receiving tubes, the data show typical operating conditions in particular services. These typical operating values are given to show concisely some guiding information for the use of each type. They are not to be considered as ratings, because the tube can be used under any suitable conditions within its rating limitations.

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TUBE RATINGS

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RECEIVING TUBES

The ratings of all receiving tubes currently used in new equipment are set up according to the design-center system. Older and obsolescent types of receiving tubes still have absolute maximum ratings because these types are used only for renewal purposes and, therefore, design-center values are of no practical value. **Receiving-tube types rated on the design-center system are identified in the Receiving-Tube Section either by a large star in the index corner of each data page or by the statement "Maximum Ratings Are Design-Center Values" preceding the ratings on each data page.**

TRANSMITTING TUBES

The ratings of transmitting tubes grouped in the Transmitting-Tube Section are on the basis of the absolute system. This system enables the transmitter design engineer to choose his design values so as to obtain maximum performance within the tube ratings. Such design procedure has been considered practical for large transmitters where adequate controls are usually incorporated in the design, and ordinarily an experienced operator is present to make any necessary adjustments.

The maximum ratings given for each transmitting type on its data pages apply only when the type is operated at frequencies lower than some specified value which depends on the design of the type. As the frequency is raised above the specified value, the radio-frequency currents, dielectric losses, and heating effects increase rapidly. Most types can be operated above their specified maximum frequency provided the plate voltage and plate input are reduced in accordance with the information given in the table "Transmitting-Tube Ratings vs Operating Frequency" in the front part of the Transmitting-Tube Section.

For certain air-cooled transmitting tubes, two sets



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of absolute maximum values are shown to meet diversified design requirements. One set is designated as CCS (Continuous Commercial Service) ratings, while the other is called ICAS (Intermittent Commercial and Amateur Service) ratings.

Continuous Commercial Service is defined as that type of service in which long tube life and reliability of performance under continuous operating conditions are the prime consideration. To meet these requirements, the CCS ratings have been established.

Intermittent Commercial and Amateur Service is defined to include the many applications where the transmitter design factors of minimum size, light weight, and maximum power output are more important than long tube life. These various factors have been taken into account in establishing the ICAS ratings.

Under the ICAS classification are such applications as the use of tubes in amateur transmitters, and the use of tubes in equipment where transmissions are of an intermittent nature. The term "intermittent" is used to identify operating conditions in all applications other than amateur in which no operating or "on" period exceeds 5 minutes and every "on" period is followed by an "off" or standby period of at least the same or greater duration.

ICAS ratings are considerably higher than CCS ratings. They permit the handling of greater power, but tube life under ICAS conditions, of course, is reduced. However, the transmitter designer may very properly decide that a small tube operated with ICAS ratings better meets his requirements than a larger tube operated with CCS ratings. Although such use involves some sacrifice in tube life, the period over which tubes will continue to give satisfactory performance in intermittent service can be extremely long depending on the exact nature of the service.



TUBE RATINGS

(continued from preceding page)

The choice of tube operating conditions best fitted for any particular application should be based on a careful consideration of all pertinent factors.

RECTIFIER TUBES

Rectifier tubes used principally in receiving equipment are rated according to the design-center system, while those used primarily in transmitting and laboratory equipment are rated according to the absolute system. The method of identifying which rating system is used for any rectifier tube in this Handbook is the same as that for other tubes in the particular section of the Handbook in which data for the rectifier tube are given.

The ratings of rectifier tubes are based on fundamental limitations in the operation of the tubes themselves, and in general include the following: maximum peak inverse plate voltage, maximum peak plate current, and maximum d-c output current.

Maximum peak inverse plate voltage is the highest instantaneous plate voltage which the tube can withstand recurrently in the direction opposite to that in which it is designed to pass current. For mercury-vapor tubes and gas-filled tubes, it is the safe top value to prevent arc-back in the tube operating within the specified temperature range.

In determining peak inverse plate voltage on a rectifier tube in a particular circuit, the equipment designer should remember that the relations between peak value of inverse plate voltage, rms value of input voltage, and average value of output voltage, depend largely on the characteristics of the particular rectifier circuit and the power supply. Furthermore, the presence of transients, such as line surges and keying surges, or waveform distortion, may raise the actual inverse plate voltage to a peak higher than that calculated for sine-wave voltages. Therefore, the **actual** inverse plate voltage on a rec-



TUBE RATINGS

(continued from preceding page)

tifier tube should never exceed the maximum peak inverse plate voltage rating for that tube. The peak inverse plate voltage may be determined with an electronic peak voltmeter of the self-contained battery type.

In single-phase, full-wave rectifier circuits with sine-wave input and pure resistance load, the peak inverse plate voltage is approximately 1.4 times the rms value of the plate-to-plate voltage supply. In single-phase, half-wave circuits with sine-wave input and pure resistance load, the peak inverse plate voltage is approximately 1.4 times the rms value of the plate voltage supply, but with condenser input to filter, the peak inverse plate voltage may be as high as 2.8 times the rms value of the plate voltage supply.

Maximum peak plate current is the highest instantaneous plate current that a tube can safely carry recurrently in the direction of normal current flow. The safe value of this peak current in hot-cathode types of rectifier tubes is a function of the electron emission available and the duration of the pulsating current flow from the rectifier tube in each half-cycle.

The value of peak plate current in a given rectifier circuit is largely determined by filter constants. If a large choke is used at the filter input, the peak plate current is not much greater than the load current; but if a large condenser is used at the filter input, the peak current may be many times the load current. In order to determine accurately the peak plate current in any rectifier circuit, the designer should measure it with a peak-indicating meter or use an oscillograph.

Maximum d-c output current is the highest average plate current which can be handled continuously by a rectifier tube. Its value for any rectifier tube type is based on the permissible plate dissipation of that type. Under operating conditions involving a rapidly



TUBE RATINGS

(continued from preceding page)

repeating duty cycle (steady load), the average plate current may be measured with a d-c meter. In the case of certain mercury-vapor tubes where the load is fluctuating, it is necessary to determine the average current over the time interval specified on the data pages for these types.

In addition to the above ratings for rectifier tubes, other ratings may be set up for a rectifier tube when the service in which the tube is to be used makes such ratings essential for satisfactory performance. Such ratings are: maximum surge plate current, and maximum heater-cathode potential.

Maximum surge plate current is the highest value of abnormal peak currents of short duration that should pass through the rectifier tube under the most adverse conditions of service. This value is intended to assist the equipment designer in a choice of circuit components such that the tube will not be subjected to disastrous currents under abnormal service conditions approximating a short circuit. This surge-current rating is not intended for use under normal operating conditions because subjecting the tube to the maximum surge current even only once may impair tube life. If the tube is subjected to repeated surge currents, its life will be seriously reduced or even terminated.

Maximum heater-cathode potential is the highest instantaneous value of voltage that a rectifier tube can safely stand between its heater and cathode. This rating is applied to certain rectifier tubes having a separate cathode terminal and used in applications where excessive potential may be introduced between heater and cathode. For convenience, this rating is usually given as a d-c value.

CATHODE-RAY TUBES

The ratings of some cathode-ray tubes are set up on the absolute system while others are set up on the design-center system. Initially, cathode-ray tubes



TUBE RATINGS

(continued from preceding page)

were all rated according to the absolute system. With the advent of television which presented design conditions similar to those in the receiving-set field, the method of rating popular types of cathode-ray tubes was changed to the design-center system. More recently, because of procedure standardized by the RMA Cathode-Ray-Tube Committee, newer types of cathode-ray tubes are being rated on the absolute system. Cathode-ray types rated according to the design-center system are identified in the Cathode-Ray Types Section by a statement to that effect just ahead of the maximum ratings on each data page. The data pages of types rated according to the absolute system have either (1) no identifying statement as to the rating system, or (2) an identifying statement that the ratings are according to the absolute system.

PHOTOTUBES

The ratings of all phototubes in the Phototube Section are on the absolute maximum basis. This basis enables the designing engineer to choose design values so as to obtain optimum performance within tube ratings. In the case of gas phototubes, the value to which the plate voltage and the plate current can be raised is abruptly limited by ionization effects. If these are allowed to occur, they may ruin the photosurface almost instantly. While phototubes in general might be rated on the design-center basis, such a procedure, with provision for an adequate factor of safety to take care of all conditions of operation, would impose undue limitations on the use of gas phototubes.

MISCELLANEOUS SPECIAL TUBES

The ratings of some of the various tube types grouped in the Miscellaneous-Types Section are according to the design-center system while others are according to the absolute system. Miscellaneous types rated on the design-center basis are identified



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(continued from preceding page)

by a statement to that effect on the data pages or else refer back for ratings to a receiving-tube type whose rating basis is explained under TUBE RATINGS—Receiving Tubes. The data pages of types rated according to the absolute system have either (1) no identifying statement as to the rating system, or (2) an identifying statement that the ratings are according to the absolute system.

CHARACTERISTICS and TYPICAL OPERATING CONDITIONS

In addition to showing the ratings of each tube type, the data pages for many of the types in this Handbook include "characteristics," such as amplification factor, plate resistance, and transconductance, which help to distinguish between the electrical features of the respective types. Usually, the characteristics shown for any type are obtained for that type in class A service: where class A data are given for the type, the characteristics are included with that data for convenience. Based on a large number of tubes of a given type, the values shown for these characteristics are average values.

Range of Characteristics—The equipment designer should bear in mind that individual tubes of a given type may have characteristics values either side of the average values shown for the type. He should also realize that these characteristics change during the life of individual tubes. In designing equipment, therefore, he should allow for the maximum cumulative variation of any characteristic from the average value of that characteristic as shown in the tabulated data for the type. The exact percentage of the variation will be different for different types of tubes depending on the design of the tubes and their intended application, but in general the designer should consider a probable plus or minus variation of not less than 30 per cent.

Furthermore, the equipment designer should recog-



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nize the desirability of designing equipment so that the full range of the operating characteristics of tubes will be utilized. If this practice is not followed, he imposes on the equipment user special replacement problems in that the user will have to select tubes suitable for use in the equipment, and may not be able to obtain the full life capability of such tubes.

Typical Operating Values—Also included on the data pages is information on typical operating conditions for most of the various tubes when used in particular services. These typical operating values are intended to show concisely some guiding information for the use of each type. They must not be considered as ratings because each type can, in general, be used under any suitable conditions within its rating limitations. In referring to these values for transmitting tubes, it should be noted that the power output value is not a rating. It is an approximate tube output, i.e., tube input minus plate loss. Circuit losses must be subtracted from tube output in determining useful output.

Datum Point for Electrode Potentials—In the data for any type in the Handbook, the values for grid bias and positive-potential-electrode voltages are given with reference to a specified datum point as follows. For types having filaments heated with d.c., the negative filament terminal is taken as the datum point to which other electrode voltages are referred. For types having filaments heated with a.c., the mid-point (i.e., the center tap on the filament-transformer secondary, or the mid-point on a resistor shunting the filament) is taken as the datum point. For types having equipotential cathodes indirectly heated, the cathode is taken as the datum point.

Grid Bias vs Filament Excitation—If the filament of any type for which data are given on a d-c basis is to be operated with an a-c supply, the given grid



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(continued from preceding page)

bias should be increased by an amount approximately equal to one half the rated filament voltage and be referred to the filament mid-point. Conversely, if it is required to use d-c filament excitation on any filament type for which the data are given on an a-c basis, the grid-bias values as given on the data pages should be decreased by an amount approximately equal to one half the rated filament voltage and be referred to the negative filament terminal instead of the mid-point as in a-c operation.

In practice, the necessity for following this rule depends on circuit conditions and operating requirements. If the bias is relatively small compared with the filament voltage and hum is a consideration, adjustment of the grid bias is ordinarily essential. Conversely, if the bias is relatively large compared with the filament voltage, adjustment of the grid bias may be unnecessary.

When filament excitation of tubes used as Audio Amplifiers is changed from d.c. to a.c., the grid return should, in general, be shifted to the mid-point of the filament circuit to minimize hum, and the bias adjusted accordingly. When the excitation is changed from a.c. to d.c., bias adjustment depending on the relative values of bias and filament voltage may be required to provide the full signal-handling capability of the tubes.

When filament excitation of tubes used as R-F Amplifiers is changed, bias adjustment is not required unless the change makes the circuit critical as to hum or signal-handling capability. For example, in class C amplifiers, the bias is usually so large in comparison with the filament voltage that adjustment is generally unnecessary.

Grid Current and Driving Power—The typical values of d-c grid current and driving power shown for triodes and tetrodes in class B r-f service and in class C service are subject to variations depending on the impedance of the load circuit. High-impe-



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(continued from preceding page)

dance load circuits require more grid current and driving power to obtain the desired output. Low-impedance circuits need less grid current and driving power, but plate-circuit efficiency is sacrificed. In comparison, the d-c grid current and driving power shown for beam tubes and pentodes in class B r-f service and in class C service are not as critical to variations in load-circuit conditions. In any event, sufficient grid current should be used so that the stage is "saturated," i.e., so that a small change in grid current results in negligible change in power output. Regardless of the type of tube used, the driving stage should have a tank circuit of good regulation and should be capable of delivering power in excess of the indicated power by a factor of several times.



TYPES OF CATHODES

AND THEIR USE

In electron tubes, a cathode is an electrode which is the primary source of electron or ion emission. There are two broad classes of cathodes, i.e., hot and cold. "Hot cathodes" are defined as cathodes which are heated or otherwise operate at elevated temperature (frequently incandescent) in order to function as emitters. In contrast, "cold cathodes" are defined as cathodes which do not rely on heat or on elevated temperature in order to function as emitters.

HOT CATHODES

Hot cathodes commonly in use in electron tubes are classified as directly heated, indirectly heated, and ionic-heated.

A **directly heated cathode**, or filament-cathode, is a wire or ribbon which is heated by the passage of current through it. It is further classified by identifying the filament material or the electron-emitting material. Such materials in regular use are pure tungsten, thoriated tungsten, and metals coated with alkaline-earth oxides. Each of these materials has distinctive advantages which are utilized in the design of tubes for particular applications.

PURE-TUNGSTEN FILAMENTS are used in certain tubes, especially those for high-voltage transmitting service. Since these filaments must operate at a high temperature of about 2500°C (a dazzling white) to emit sufficient electrons, a relatively large amount of filament power is required. The operating life of these filaments is determined by the rate of tungsten evaporation. Their failure, therefore, occurs through decreased emission or burn-out.

Pure-tungsten filaments give best life performance when they are operated so as to conserve their emitting capability. They are designed with voltage and current ratings in accord with the service expected of the particular tube type. However, in applications where the normal emission at rated voltage is not



TYPES OF CATHODES

(continued from preceding page)

required, the filament can be operated at a somewhat reduced voltage. The extent of the reduction depends on the peak emission requirements of the application as well as on the percentage regulation of the filament voltage. When these are known, the correct operating filament voltage for any tungsten-filament type can be calculated from its filament-emission characteristic. The permissible regulation in transmitters may be checked by reducing the filament voltage (with the transmitter under normal operation) to a value such that reduction in output can just be detected. The filament voltage must then be increased by an amount equivalent to the maximum percentage regulation of the filament-supply voltage and then increased further by approximately 2 per cent to allow for minor variations in emission of individual tubes. It follows that the better the regulation, the less the filament operating voltage and, therefore, the longer the filament life.

It should be noted that a reduction of 5 per cent in the filament voltage applied to tubes with pure-tungsten filaments will approximately double their life. A reduction of 15 per cent will increase the filament life almost tenfold.

During long or frequent standby periods, pure-tungsten-filament tubes may be operated at decreased filament voltage to conserve life. When the average standby time is an appreciable portion of the average duty cycle and is less than 2 hours, it is recommended that the filament voltage of all but the largest types be reduced to 80 per cent of normal; and that for longer periods, the filament power be turned off. For the largest types, such as the 898, it is recommended that the filament voltage be reduced to 80 per cent of normal during standby operation up to 12 hours; and that for longer periods, the filament power be turned off.

For turning on filament power, a filament starter should be used so as to increase the voltage gradually and to limit the high initial rush of current through



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(continued from preceding page)

the filament. It is important that the filament current never exceed, even momentarily, a value of more than 150 per cent of normal, unless the tube data specify otherwise. Similarly, as an added precaution, the filament power should be turned off gradually to prevent cooling strains in the filament.

THORIATED-TUNGSTEN FILAMENTS are now used mainly in certain transmitting and special tubes. Thoriated-tungsten filaments are made from tungsten impregnated with thoria. Due to the presence of thorium, these filaments liberate electrons at a more moderate temperature of about 1700°C (a bright yellow), and are, therefore, much more economical of filament power than are pure-tungsten filaments. The operating life of thoriated-tungsten filaments is ordinarily ended by a decrease in electron emission. Decreased emission, however, may be caused by the accidental application of too high filament, screen, or plate voltage. If the over-voltage has not been continued for a long time, the activity of the filament can often be restored by operating the filament at its normal voltage for 10 minutes or longer without plate, screen, or grid voltage. The reactivation process may be accelerated by raising the filament voltage to not higher than 120 per cent of normal value for a few minutes. This reactivation schedule is often effective in restoring the emission of thoriated-tungsten filaments in tubes which have failed after normal service. Sometimes a few hundred hours of additional life may be obtained after reactivation.

The operating voltage of a thoriated-tungsten filament should, in general, be held to within ± 5 per cent of its rated value. However, in transmitting applications where the tube is lightly loaded, the filament may be operated on the low side—as much as 5 per cent below normal voltage. As conditions require, the voltage should be increased gradually to maintain output. Toward the end of life, additional service may be obtained by operating the fila-



TYPES OF CATHODES

(continued from preceding page)

ment above its rated voltage. It should be noted that a tube having a thoriated-tungsten filament should never be operated under emission-limited conditions since this type of operation may overheat the tube and cause permanent loss of emission.

During standby periods in transmitting service, thoriated-tungsten filaments may be operated according to the following recommendations to conserve life. For short standbys of less than 15 minutes duration, the filament voltage of all but the largest types should be reduced to 80 per cent of normal; for longer periods, the filament power should be turned off. For the largest types, such as the 827-R and 861, it is recommended that the filament voltage be reduced to 80 per cent of normal during standby operation up to 2 hours; and that for longer periods, the filament power be turned off.

COATED FILAMENTS are used in receiving tubes, certain transmitting tubes, most mercury-vapor rectifiers, and some special tubes. Coated filaments employ a relatively thick coating of alkaline-earth compounds on a metallic base as a source of electronic emission. The metallic base carries the heating current. These filaments operate at a low temperature of about 800°C (a dull red) and require relatively little power to produce a copious supply of electrons.

For proper performance of these types, rated filament voltage should, in general, be applied at the filament terminals. However, when coated-filament, high-vacuum tubes are used in transmitting service with light loading, the filament voltage may be reduced as much as 5 per cent below normal to conserve life. Then, as conditions require, the voltage should be increased gradually to maintain output. Toward the end of life, the gradual increase may be carried above rated filament voltage to obtain additional service. In the case of gas or vapor tubes, it is important that these types be operated, in general, at rated filament voltage. However, if the line regu-



TYPES OF CATHODES

(continued from preceding page)

lation regularly and consistently does not exceed 1 to 2 per cent, it is practical to reduce the filament voltage slightly (not over 5 per cent) with benefit to tube life.

During standby periods of less than 15 minutes, the filament voltage of quick-heating, high-vacuum types, such as the 1616 and 1624, should be reduced to 80 per cent of normal; for longer periods, the filament power should be turned off. In contrast, the voltage of coated filaments in gas or vapor tubes should not be reduced during standbys except under conditions explained in the preceding paragraph. In general, the filament voltage of small and medium types, such as the 866-A/866 and 872-A/872, should be maintained at normal rated value during standbys up to 2 hours; for longer periods, the filament power should be turned off. For large types, such as the 857-B, the filament voltage should be maintained at normal rated value during standbys up to 12 hours; for longer periods, the filament power should be turned off.

After having given normal service or after having been operated at excessive voltage, coated filaments lose their emission. When such is the case, their usefulness may be considered as terminated.

An indirectly heated cathode, or heater-cathode, consists of a heater wire enclosed in a thin metal sleeve coated on the outside with electron-emitting material similar to that used for coated filaments. The sleeve is heated by radiation and conduction from the heater through which current is passed. Useful emission does not take place from the heater wire. An important feature of this kind of cathode construction is that the functions of heating and emission can be independent of each other.

HEATER-CATHODES, or unipotential cathodes as they are frequently called, are used in high-vacuum tubes operating at low plate voltage, such as receiv-



TYPES OF CATHODES

(continued from preceding page)

ing tubes, low-power transmitting tubes, and small special tubes. They also find application in mercury-vapor tubes and in cathode-ray tubes. Heater-cathodes, like coated filaments, provide a copious supply of electron emission at low cathode temperature (a dull red).

For proper performance of heater-cathode tubes, rated heater voltage should, in general, be applied at the heater terminals. However, when heater-cathode high-vacuum tubes are used in transmitting service and are lightly loaded, the heater voltage may be reduced as much as 5 per cent below normal to conserve life. As conditions require, the voltage should be increased gradually to maintain output. Toward the end of life, the gradual increase may be carried above rated heater voltage to obtain additional service.

During standby periods of less than 15 minutes, the heater voltage of high-vacuum tubes should be maintained at normal rated value; for longer periods, the heater power should be turned off. In the case of vapor or gas tubes, the heater voltage should be maintained at normal during standby periods up to 12 hours; for longer periods, the heater power should be turned off.

An ionic-heated cathode is one which liberates electrons when it is subjected to intense positive ion bombardment. The bombardment may be so intense as to raise the temperature of the cathode, frequently causing it to become visibly hot. The ionic-heated cathode in radio tubes has found application in gas rectifiers intended primarily for automobile receiver service.

COLD CATHODES

The designation "cold cathode" is commonly used in referring to those cathodes which emit electrons when they are subjected to bombardment by other electrons, ions, or metastable atoms. Cathodes of



TYPES OF CATHODES

(continued from preceding page)

this type are sometimes designated as secondary-emission cathodes. They are used in certain glow-discharge tubes, and also in multiplier phototubes where they contribute to electron multiplication in the successive dynode stages.

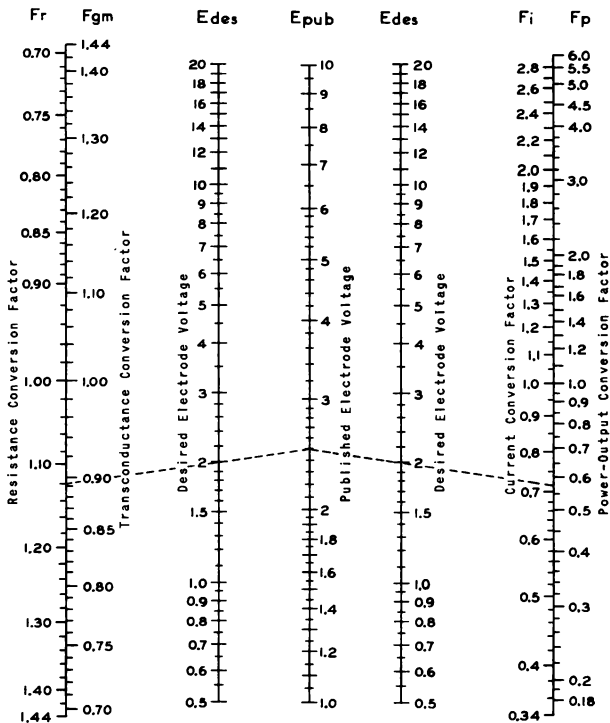
Not customarily referred to as cold cathodes, although they are such, is another group of emitters known as photocathodes. By definition, a **photocathode** is one which emits electrons when it is energized with radiant flux, such as light, infra-red radiation, or ultra-violet radiation. Such cathodes are used in phototubes. When used in gas phototubes, these cathodes not only emit under the influence of radiant flux but also as a result of bombardment and thus become partial secondary-emission cathodes.

Photocathodes are classified according to the spectral response characteristics of their respective photoactive surfaces. The S1 photosurface gives high response to red and near infra-red radiation. The S2 photosurface is similar to the S1 surface but extends somewhat further into the infra-red region. The S3 photosurface has a spectral response characteristic which is closest to that of the eye. The S4 photosurface has exceptionally high response to blue and blue-green radiation with negligible response to red radiation.

Exposure of photocathodes to intense light, such as direct sunlight, may decrease the sensitivity of the tubes in which they are used, even though there is no voltage applied. The magnitude and duration of the decrease depend on the length of the exposure. Permanent damage to a phototube may result if it is exposed to radiant energy so intense as to cause excessive heating of the cathode.



CONVERSION FACTORS



CONVERSION FACTOR NOMOGRAPH

The Conversion Factor Nomograph shown above may be used to determine the approximate characteristics of an electron tube when all the electrode voltages are changed in the same proportion from the published or measured values.

The conversion factors obtained from the nomograph are applicable to triodes, tetrodes, pentodes, and beam power tubes when the plate voltage, grid-No.1 voltage, and grid-No.2 voltage are changed simultaneously by the same factor. They may be used for any class of tube operation (class A, AB₁, AB₂, B, or C).

The nomograph may be used to determine the proper value for each conversion factor for a specified relationship (F_e)



CONVERSION FACTORS

between published or measured values (E_{pub}) and desired values (E_{des}) of operating voltage. The dashed lines on the nomograph indicate the correct procedure for determining each of these conversion factors when it is desired to reduce the operating electrode voltage from 250 to 200 volts.

EXAMPLE

Published characteristics for a typical pentode are listed below for a plate voltage of 250 volts. If it is desired to determine the characteristics of this tube for a plate voltage of 200 volts, the voltage conversion factor, F_e , is equal to $200/250$ or 0.8. The values for the other conversion factors are obtained from the nomograph. By use of these factors characteristics values at a plate voltage of 200 volts are obtained.

	<i>Published Value</i>	<i>Conversion Factor</i>	<i>Desired Value</i>	
Plate Voltage	250	0.8	200	volts
Grid-No.2 Voltage	250	0.8	200	volts
Grid-No.1 Voltage	-15	0.8	-12	volts
Plate Current	30	0.72	21.6	ma
Grid-No.2 Current	6	0.72	4.3	ma
Plate Resistance (Approx.) . .	0.13	1.12	0.15	megohm
Transconductance.	2000	0.89	1780	μ mhos
Load Resistance	10000	1.12	11200	ohms
Total Harmonic Distortion . .	10	unchanged	10	%
Max.-Signal Power Output. . .	2.5	0.57	1.42	watts

LIMITATIONS

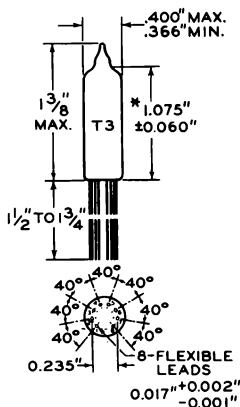
Because this method for conversion of characteristics is necessarily an approximation, progressively greater errors will be introduced as the voltage conversion factor ($F_e = E_{des}/E_{pub}$) departs from unity. In general, it may be assumed that results obtained will be approximately correct when the value of F_e is between 0.7 and 1.5. When F_e is extended beyond these limits (down to 0.5 or up to 2.0), the accuracy becomes considerably reduced and the results obtained can serve only as a rough approximation.

It should be noted that this method does not take into account the effects of contact potential or secondary emission in electron tubes. Contact potential, however, may safely be neglected for most applications because its effects are noticeable only at very low grid-No.1 voltages. Secondary emission may occur in conventional tetrodes at low plate voltages. For such tubes, therefore, the use of conversion factors should be limited to regions of the plate characteristic in which the plate voltage is greater than the grid-No.2 voltage. For beam power tubes, the regions of both low plate currents and low plate voltages should also be avoided.



OUTLINES — Glass Tubes

SUBMINIATURE--Flexible Lead Type



JETEC No. 3-1

* Measured from bulb seat to bulb-top line as determined by a ring gauge of 0.210 ± 0.001 I.D.

MAY 1, 1955

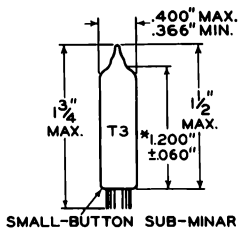
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES 1



OUTLINES — Glass Tubes

SUBMINIATURE--Sub-Minar 8-Pin Base Type



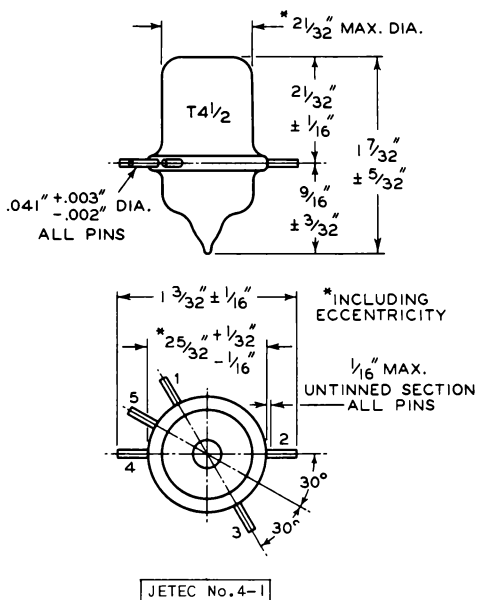
JETEC No. 3-5

* Measured from base seat to bulb-top line as determined by a ring gauge of $0.210'' \pm 0.001''$ I.D.



OUTLINES—Glass Tubes

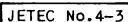
ACORN--Radial 5-Pin Base Type



For additional socket design information,
see back of "Outlines 3" sheet



**ACORN--Radial 5-Pin Base Type
with End Terminals**

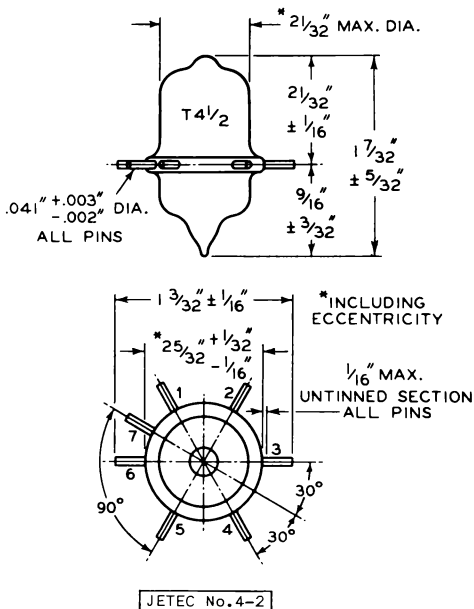


For additional socket design information,
see back of "Outlines 3" sheet



OUTLINES—Glass Tubes

ACORN--Radial 7-Pin Base Type



For additional socket design information,
see back of this sheet

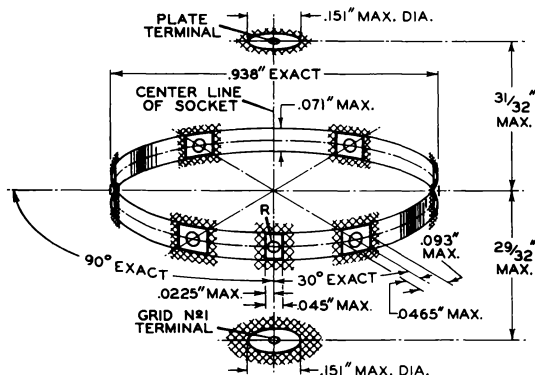


OUTLINES—Glass Tubes

ACORN TYPES

MAXIMUM PIN AND TERMINAL VARIATIONS AT SOCKET CLIPS AND TERMINAL CONNECTORS

ESSENTIAL DIMENSIONS FOR SOCKET DESIGN



Reference Pin (R)

Base Type	Pin No. *
Radial 5-Pin	5
Radial 5-Pin with End Terminals.	5
Radial 7-Pin	7

The above composite diagram shows the ideal positions of radial-pin cross-sections at socket clips located on a circle of 0.938" diameter, as well as end-terminal cross-sections at terminal ends.

The areas within the cross-hatching show actual variations of radial-pin and end-terminal cross-sections, and indicate the maximum variations which socket clips and terminal connectors should accommodate.

The clear area for pin position R is narrower than the others because pin position R is used as a reference for the other pins.

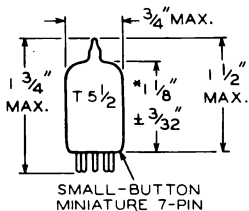
Sockets should be designed so that the maximum diametric clearance between socket clips is never less than 0.850".

* For pin numbering of each of these bases, see respective Dimensional Outline on preceding pages.

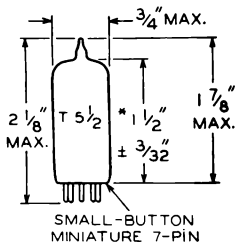


OUTLINES—Glass Tubes

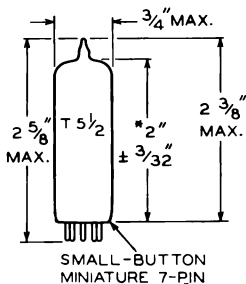
MINIATURE--Miniature 7-Pin Base Types



JETEC No. 5-1



JETEC No. 5-2



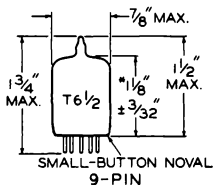
JETEC No. 5-3

* Measured from base seat to bulb-top line as determined by ring gauge of $\frac{7}{16}"$ I.D.

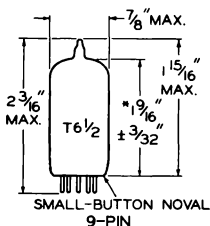


OUTLINES — Glass Tubes

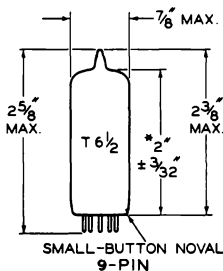
MINIATURE--Noval 9-Pin Base Types



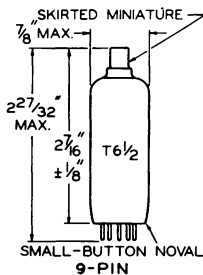
JETEC No. 6-1



JETEC No. 6-2



JETEC No. 6-3



JETEC No. 6-7

* Measured from base seat to bulb-top line as determined by ring gauge of 7/16" I.D.



OUTLINES—Glass Tubes

GLASS OCTAL--Octal Base Types with T9 Bulbs

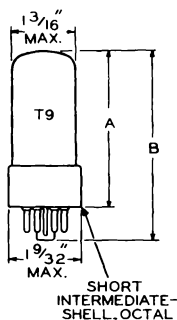


Fig. 1

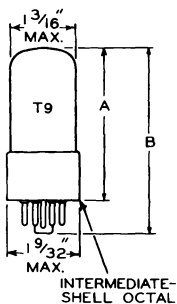


Fig. 2

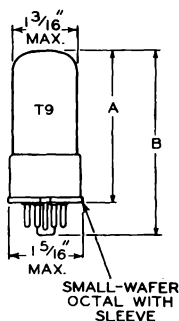
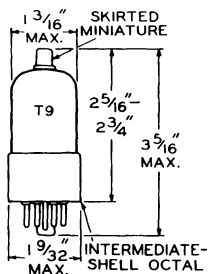
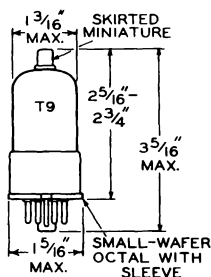


Fig. 3

OUTLINE			DIMENSION	
JETEC No.			A	B
Fig. 1	Fig. 2	Fig. 3	Max. INCHES	Max. INCHES
-	9-1	-	1-3/4*	2-5/16
-	9-7	-	2-1/2	3-1/16
9-41	9-11	9-12	2-3/4	3-5/16
-	9-13	-	2-13/16	3-3/8
-	9-15	-	2-7/8	3-7/16
-	9-33	-	3-1/4	3-13/16



JETEC No. 9-17



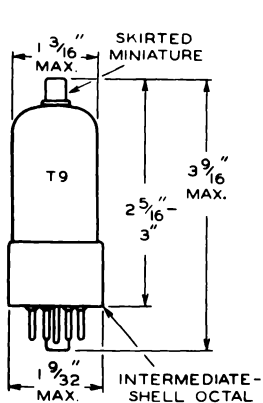
JETEC No. 9-18

* For electron-ray tubes, the seated height is $1-11/16" + 1/16" - 1/4"$.

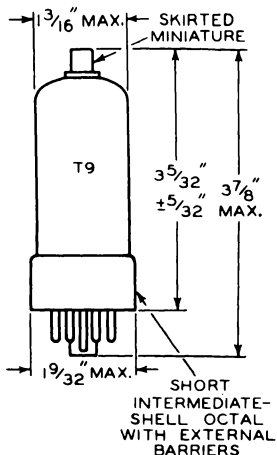


OUTLINES—Glass Tubes

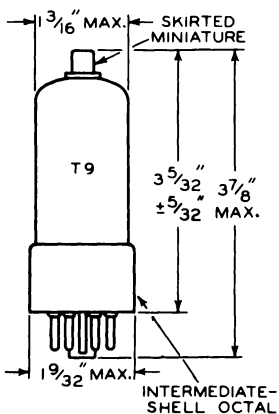
GLASS OCTAL--Octal Base Types
with T9 Bulbs



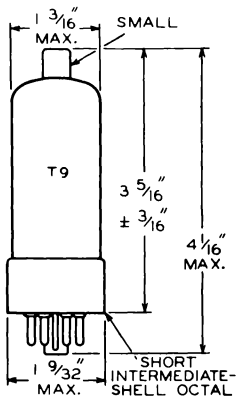
JETEC No. 9-23



JETEC No. None



JETEC No. None

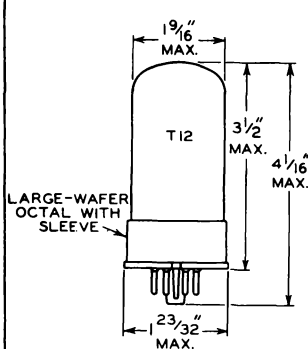


JETEC No. 9-51

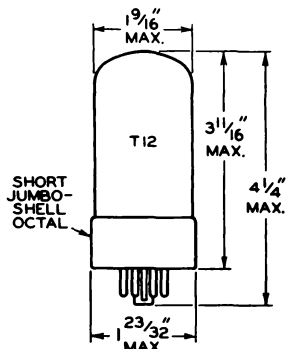


OUTLINES—Glass Tubes

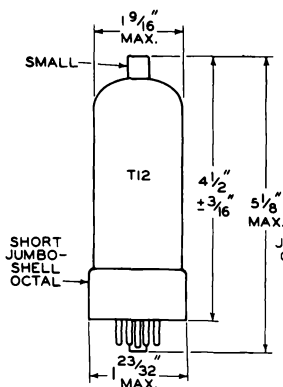
GLASS OCTAL--Octal Base Types
with T12 Bulbs



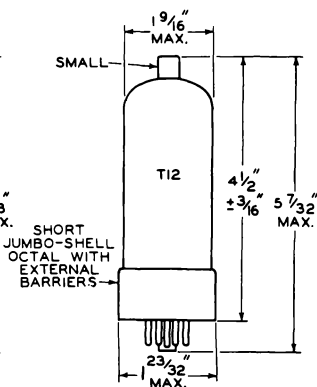
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JETEC No. None



JETEC No. None

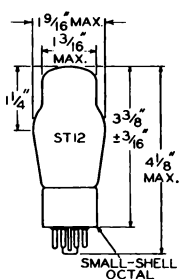


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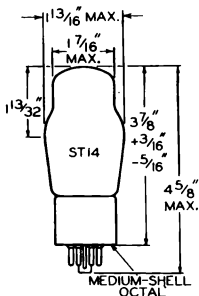


OUTLINES—Glass Tubes

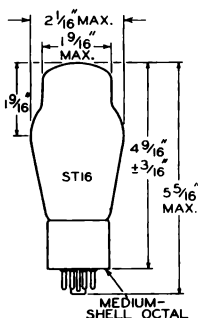
GLASS OCTAL--Octal Base Types
with ST Bulbs



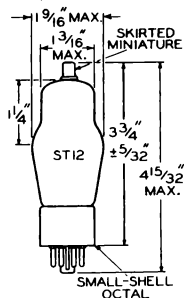
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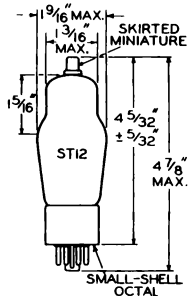
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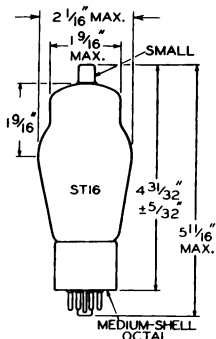
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JETEC No. 12-8



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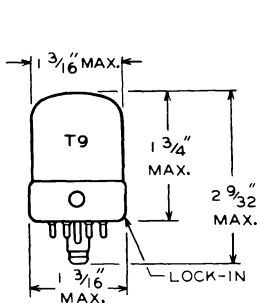


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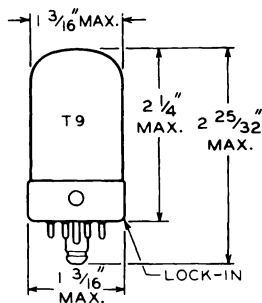


OUTLINES—Glass Tubes

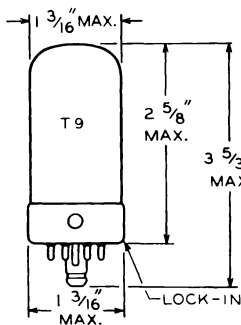
LOCK-IN--Lock-In 8-Pin Base Types



JETEC No. 9-32



JETEC No. 9-30

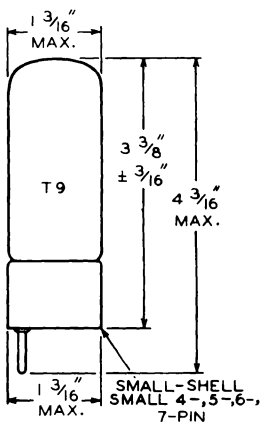


JETEC No. 9-31

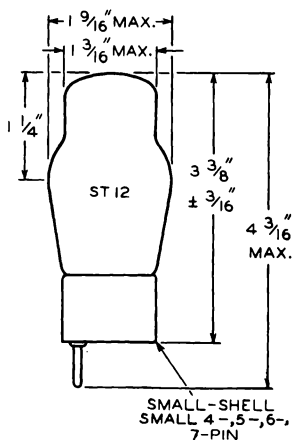


OUTLINES—Glass Tubes

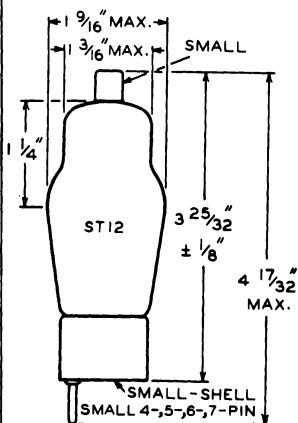
SMALL 4-PIN, SMALL 5-PIN,
SMALL 6-PIN, & SMALL 7-PIN BASE TYPES



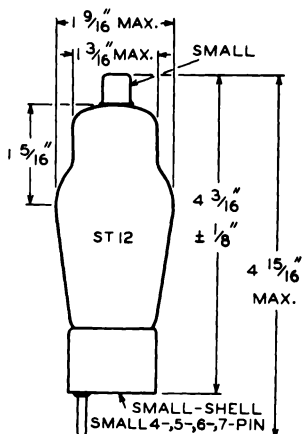
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JETEC No. 12-5



JETEC No. 12-6

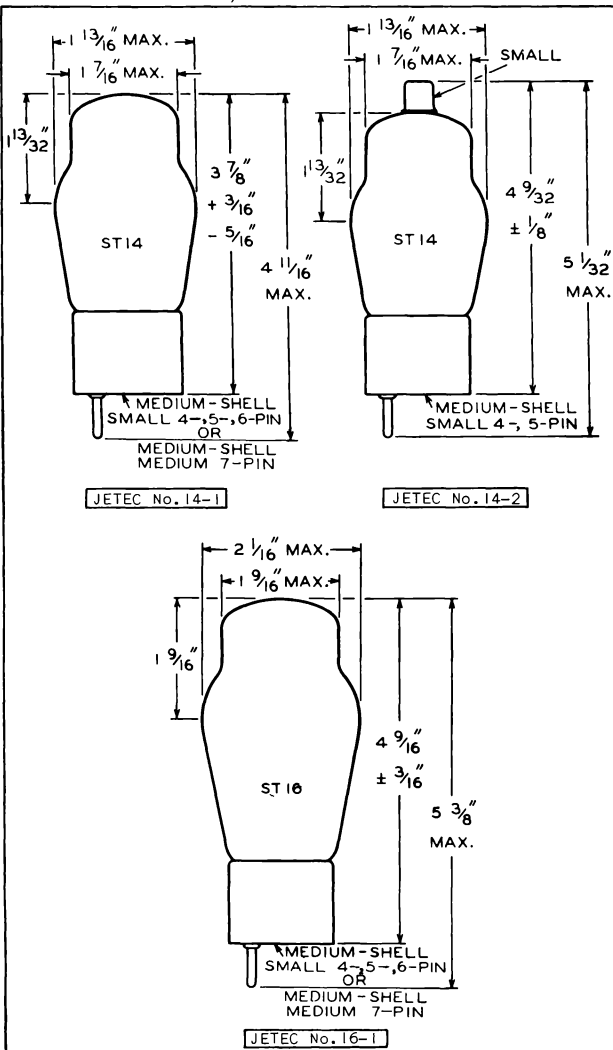


JETEC No. 12-2



OUTLINES—Glass Tubes

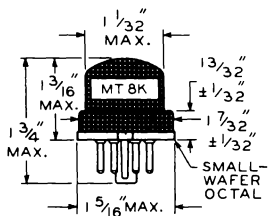
SMALL 4-PIN, SMALL 5-PIN,
SMALL 6-PIN, & MEDIUM 7-PIN BASE TYPES



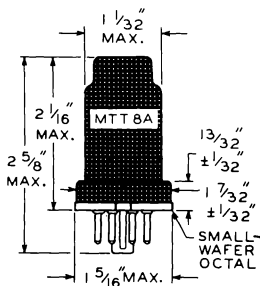


OUTLINES—Metal Tubes

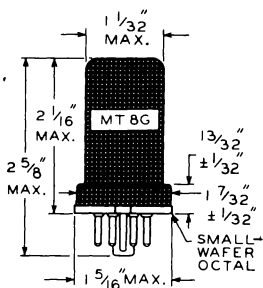
For correlation of
TUBE TYPE, ENVELOPE DESIGNATION, & OUTLINE No.,
see KEY on back of this sheet



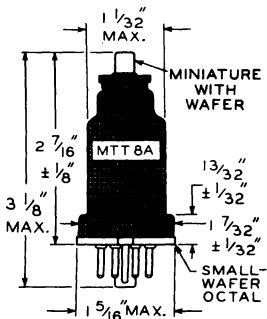
JETEC No. 8-5



JETEC No. 8-3



JETEC No. 8-1

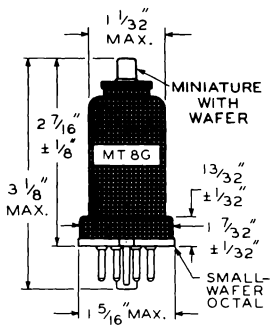


JETEC No. 8-4

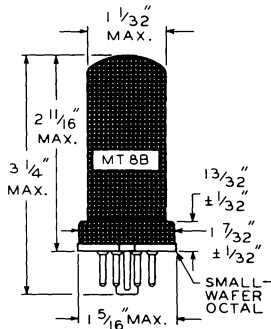


OUTLINES—Metal Tubes

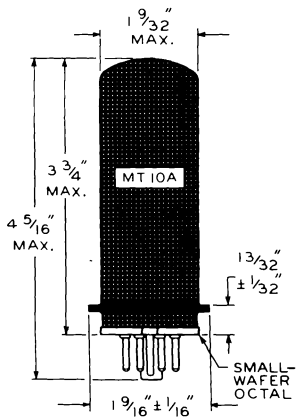
For correlation of
TUBE TYPE, ENVELOPE DESIGNATION, & OUTLINE No.,
see KEY on back of this sheet



JETEC No. 8-2



JETEC No. 8-6



JETEC No. 10-1



OUTLINES - Metal Tubes

KEY

Type No.	Envelope Designation	Outline Jetec No.	Type No.	Envelope Designation	Outline Jetec No.
0Z4	MTT8A	8-3	6ST7	MT8G	8-1
5T4	MT10A	10-1	6SZ7	MT8G	8-1
5W4	MT8B	8-6	6V6	MT8B	8-6
5Z4	MT8B	8-6	6X5	MT8B	8-6
6A8	MTT8A	8-4	12A6	MT8B	8-6
6AB7	MT8G	8-1	12C8	MTT8A	8-4
6AC7	MT8G	8-1	12H6	MT8K	8-5
6AG7	MT8B	8-6	12K8	MT8G	8-2
6B8	MTT8A	8-4	12SA7	MT8G	8-1
6C5	MT8G	8-1	12SC7	MT8G	8-1
6F5	MTT8A	8-4	12SF5	MT8G	8-1
6F6	MT8B	8-6	12SF7	MT8G	8-1
6H6	MT8K	8-5	12SG7	MT8G	8-1
6J5	MT8G	8-1	12SH7	MT8G	8-1
6J7	MTT8A	8-4	12SJ7	MT8G	8-1
6K7	MTT8A	8-4	12SK7	MT8G	8-1
6K8	MT8G	8-2	12SQ7	MT8G	8-1
6L6	MT10A	10-1	12SR7	MT8G	8-1
6L7	MTT8A	8-4	12SW7	MT8G	8-1
6N7	MT8B	8-6	12SY7	MT8G	8-1
6Q7	MTT8A	8-4	25A6	MT8B	8-6
6R7	MTT8A	8-4	25L6	MT8B	8-6
6S7	MT8G	8-2	25Z6	MT8B	8-6
6SA7	MT8G	8-1	502-A	MT8G	8-1
6SB7-Y	MT8G	8-1	1611	MT8B	8-6
6SC7	MT8G	8-1	1612	MTT8A	8-4
6SF5	MT8G	8-1	1613	MT8B	8-6
6SF7	MT8G	8-1	1614	MT10A	10-1
6SG7	MT8G	8-1	1619	MT10A	10-1
6SH7	MT8G	8-1	1620	MTT8A	8-4
6SJ7	MT8G	8-1	1621	MT8B	8-6
6SK7	MT8G	8-1	1622	MT10A	10-1
6SQ7	MT8G	8-1	1631	MT10A	10-1
6SR7	MT8G	8-1	1632	MT8B	8-6
6SS7	MT8G	8-1	1634	MT8G	8-1
			5693	MT8G	8-1



BASES

MINIMUM DIAMETERS

Until such time as the Handbook pages covering bases are re-issued to include minimum diameters of wafers, shells, and sleeves, this provisional sheet will supply these minimum diameters for the following bases to supplement the maximum diameters which are shown on the respective base drawings.

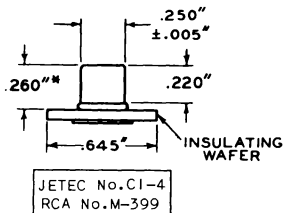
<u>Base</u>	<u>Minimum Diameter</u>
3-PIN & 4-PIN TYPES:	
Peewee 3-Pin.....	0.610"
Small 4-Nub.....	0.970"
WD 4-Pin.....	1.097"
Tapered Small 4-Pin.....	1.136"
Small 4-Pin.....	1.136"
Medium 4-Pin.....	1.337"
Medium 4-Pin with Bayonet.....	1.337"
Jumbo 4-Pin.....	1.840"
Super-Jumbo 4-Pin.....	2.177"
5-PIN TYPES:	
Small 5-Pin.....	1.136"
Medium 5-Pin.....	1.337"
Giant 5-Pin.....	2.142"
6-PIN TYPES:	
Small 6-Pin.....	1.136"
Medium 6-Pin.....	1.337"
7-PIN TYPES:	
Small 7-Pin.....	1.136"
Medium 7-Pin.....	1.337"
Medium 7-Pin with Bayonet.....	1.337"
Giant 7-Pin.....	2.146"
8-PIN TYPES:	
Dwarf Shell Octal 8-Pin.....	1.028"
Dwarf Metal Shell Octal 8-Pin.....	1.015"
Small Shell Octal 8-Pin.....	1.136"
Intermediate Shell Octal 8-Pin.....	1.235"
Small Wafer Octal 8-Pin.....	1.271"
with Sleeve No. R1483.....	{ Wafer 1.271" Sleeve 1.198"
with Sleeve No. T254.....	{ Wafer 1.271" Sleeve 1.369"
Medium Shell Octal 8-Pin.....	1.337"
Large Wafer Octal 8-Pin.....	1.677"
with Sleeve No. T253.....	{ Wafer 1.677" Sleeve 1.845"
12-PIN & 14-PIN TYPES:	
Medium Shell Diheptal 14-Pin.....	2.200"



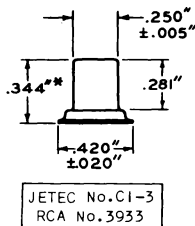
BASES

1 - TERMINAL TYPES (CAPS)

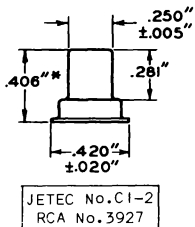
**MINIATURE
WITH WAFER**



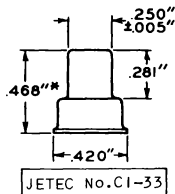
SKIRTED MINIATURE



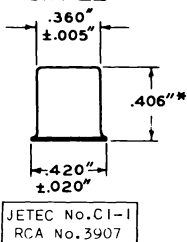
SKIRTED MINIATURE



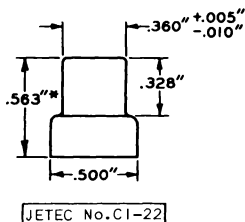
SKIRTED MINIATURE



SMALL



SKIRTED SMALL



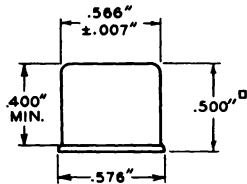
* Add 0.020* for solder on finished tube.



BASES

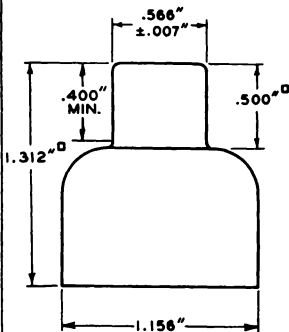
1 - TERMINAL TYPES (CAPS)

MEDIUM



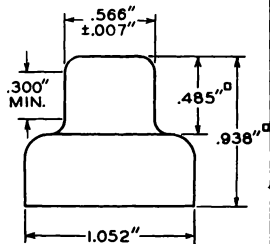
JETEC No. CI-5
RCA No. 3903

SKIRTED MEDIUM



JETEC No. CI-6
RCA No. 3904

SKIRTED MEDIUM



JETEC No. CI-14
RCA No. 3980

□ Add 0.040" for solder on finished tube.

MAY 3, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

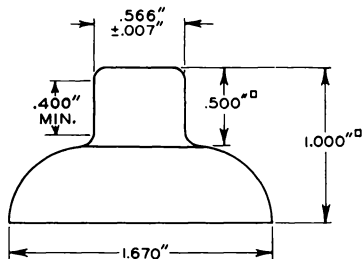
CAPS 1



BASES

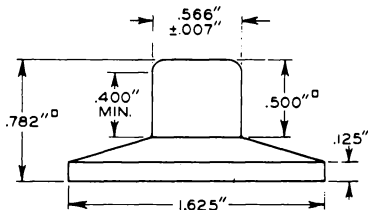
1 TERMINAL TYPES (CAPS)

SKIRTED MEDIUM



JETEC No. CI-27
RCA No. 3985

SKIRTED MEDIUM



JETEC No. CI-29
RCA No. 39002

□ Add 0.040* for solder on finished tube.

MAY 3, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

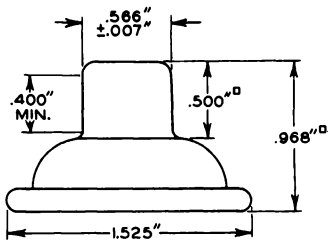
CAPS 2



BASES

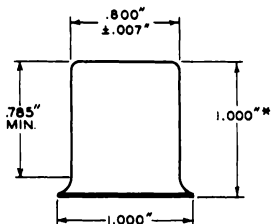
1 TERMINAL TYPES (CAPS)

SKIRTED MEDIUM WITH ROLLED EDGE



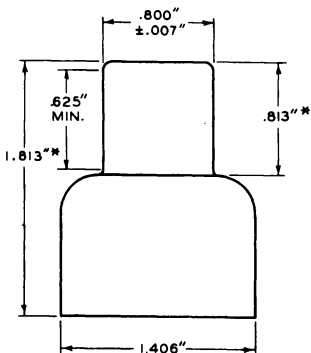
JETEC No. CI-19
RCA No. 3940

LARGE



JETEC No. CI-8
RCA No. 3910

SKIRTED LARGE



JETEC No. CI-9
RCA No. 3905

□ Add 0.040* for solder on finished tube.

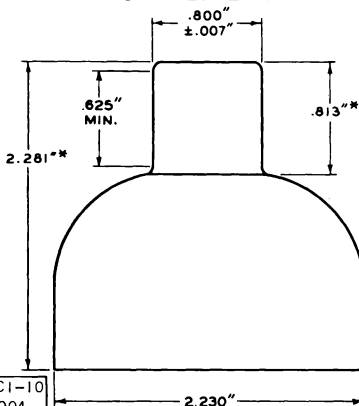
* Add 0.060* for solder on finished tube.



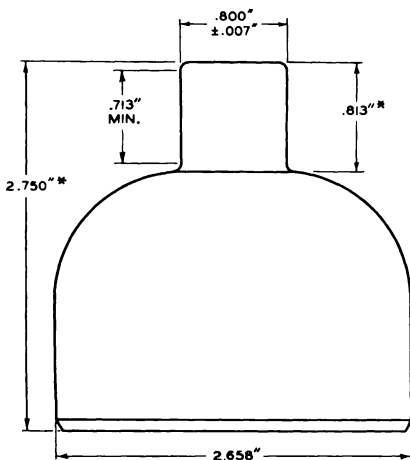
BASES

1-TERMINAL TYPES (CAPS)

SKIRTED LARGE



SKIRTED LARGE



JETEC No. CI-30
RCA No. 1902

* Add 0.060* for solder on finished tube.

MAY 3, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CAPS 3

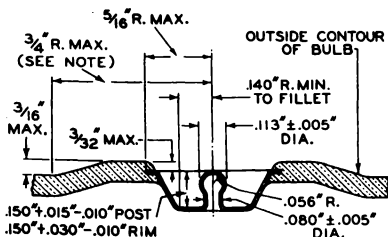


BASES

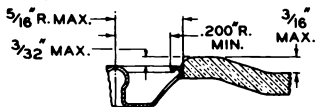
1-TERMINAL TYPES (CAPS)

DETAILS OF RECESSED SMALL BALL CAP & BULB ASSEMBLY

JETEC No. J1-22



ALTERNATE EDGE DESIGN



VARIANT SEAL SHAPES



NOTE: PROTRUSION OF GLASS AROUND CAP ABOVE BULB CONTOUR IS LIMITED TO AREA BOUNDED BY CIRCLE CONCENTRIC WITH CAP AXIS AND HAVING RADIUS OF $\frac{3}{4}$ \" MAX.

FOR ATTACHING OR DETACHING, THE CONNECTOR SHOULD REQUIRE NOT MORE THAN 8 POUNDS TOTAL FORCE PERPENDICULAR TO THE PLANE OF THE RIM OF THE CAP.

ANGLE BETWEEN PLANE OF THE RIM OF CAP AND PLANE TANGENT TO ORIGINAL CONTOUR OF BULB AT CENTER OF CAP WILL NOT BE MORE THAN 10° .

92CM-6535R4

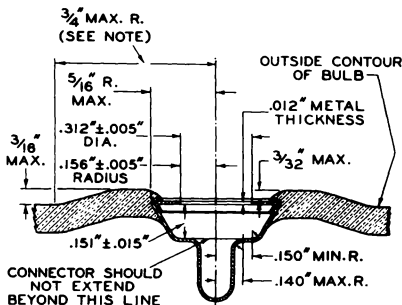


BASES

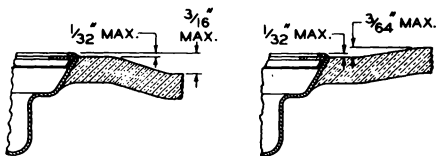
1-TERMINAL TYPES (CAPS)

DETAILS OF RECESSED SMALL CAVITY CAP & BULB ASSEMBLY

JETEC No. J1-21



VARIANT SEAL SHAPES



NOTE: PROTRUSION OF GLASS AROUND CAP ABOVE BULB CONTOUR IS LIMITED TO AREA BOUNDED BY CIRCLE CONCENTRIC WITH CAP AXIS AND HAVING RADIUS OF $\frac{3}{4}$ \" MAX.

FOR ATTACHING OR DETACHING, THE CONNECTOR SHOULD REQUIRE NOT MORE THAN 8 POUNDS TOTAL FORCE PERPENDICULAR TO THE PLANE OF THE RIM OF THE CAP.

CONNECTOR SHOULD PROVIDE POSITIVE SPRING CONTACT TO TOP AND BOTTOM INTERIOR SURFACES. IT SHOULD NOT MAKE CONTACT TO THE INSIDE TOP SURFACE ONLY.

ANGLE BETWEEN PLANE OF THE RIM OF CAP AND PLANE TANGENT TO ORIGINAL CONTOUR OF BULB AT CENTER OF CAP WILL NOT BE MORE THAN 10° .

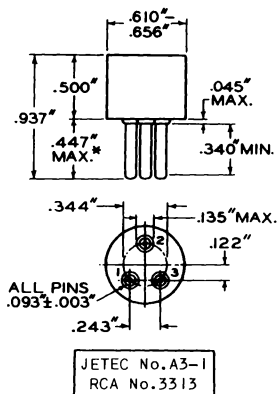
92CM-6651R2



BASES

3-PIN TYPES

SMALL-SHELL PEEWEE 3-PIN



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GA3-1) having thickness of 1/4" and three holes with diameters of 0.1030"–0.1035" so located on a 0.3440" $\pm$ 0.0005" diameter circle that the distance along the chord between two adjacent hole centers is 0.2340" $\pm$ 0.0005" and the distance along the chord between the remaining pin and the two adjacent pins is 0.3175" $\pm$ 0.0005".

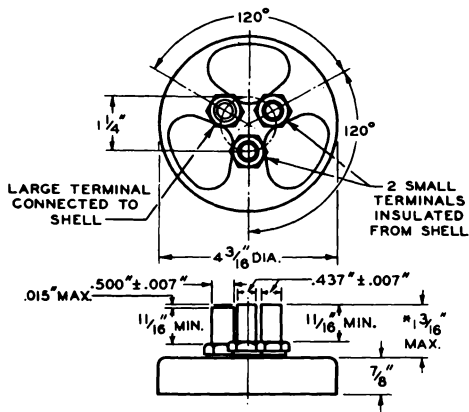
Pin fit in gauge is such that gauge together with supplementary weight totaling 2 pounds will not be lifted when pins are withdrawn.

* Add 0.020" for solder on finished tube.



BASES

3-TERMINAL TYPES



JETEC No. A3-80
RCA No. 3232

* Add $1/8$ " for solder on finished tube.

NOV. 5, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

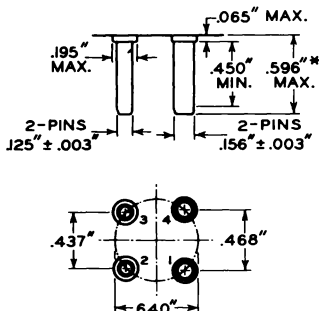
BASES 1



BASES

4-PIN TYPES

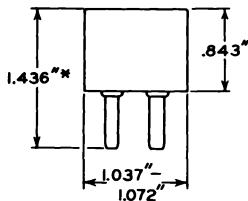
"SMALL 4-PIN" PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GA4-1) having thickness of 1/4" and four holes, two with diameters of 0.1650" ± 0.0005" and two with diameters of 0.1340" ± 0.0005" so located on a 0.6400" ± 0.0005" diameter circle that the distance between the adjacent 0.1650" diameter pins is 0.468" ± 0.0005" and the distance between the adjacent 0.1340" diameter pins is 0.437" ± 0.0005".

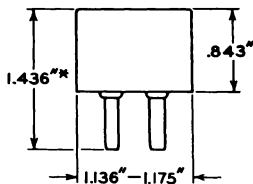
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

DWARF-SHELL SMALL 4-PIN



JETEC No. A4-26
RCA No. 4107

SMALL-SHELL SMALL 4-PIN



JETEC No. A4-5
RCA No. 4108

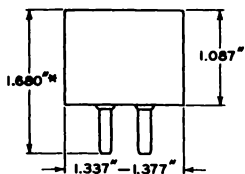
* Add 0.030" for solder on finished tube.



BASES

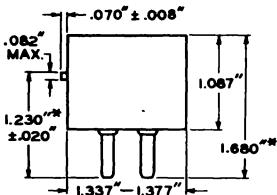
4-PIN TYPES

MEDIUM-SHELL SMALL 4-PIN



JETEC No. A4-9
RCA No. 4106

MEDIUM-SHELL SMALL 4-PIN WITH BAYONET



JETEC No. A4-10
RCA No. 4102

*For other dimensions, see first page
of the "Small 4-Pin" series.*

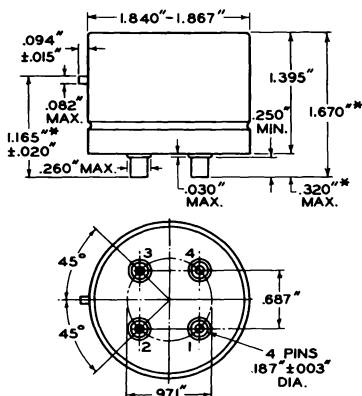
* Add 0.030" for solder on finished tube.



BASES

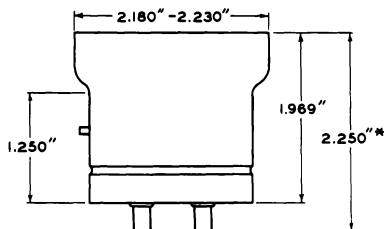
4-PIN TYPES

MEDIUM-METAL-SHELL JUMBO 4-PIN WITH BAYONET



JETEC No. A4-29
RCA No. 1839B

SKIRTED MEDIUM-METAL-SHELL JUMBO 4-PIN WITH BAYONET



JETEC No. A4-69
RCA No. 4260A

Other dimensions are same as Base JETEC No. A4-29 above.

* Add 0.060" for solder on finished tube.

JAN. 3, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

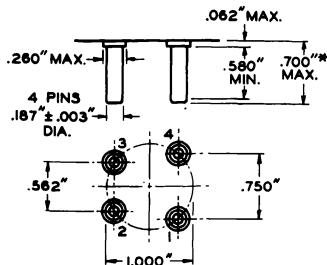
BASES 3



BASES

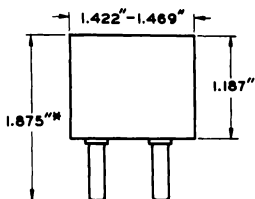
4-PIN TYPES

SUPER-JUMBO 4-PIN PIN DIMENSIONS AND ORIENTATION



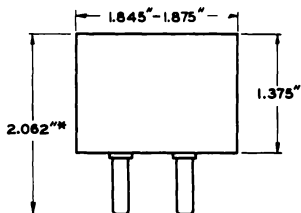
Base-pin positions are held to tolerances such that pin centers may deviate a maximum distance of 0.010" from their true geometric position.

SMALL - SHELL SUPER-JUMBO 4-PIN



JETEC No. A4-15
RCA No. 411

MEDIUM - SHELL SUPER-JUMBO 4-PIN



JETEC No. A4-16
RCA No. 412

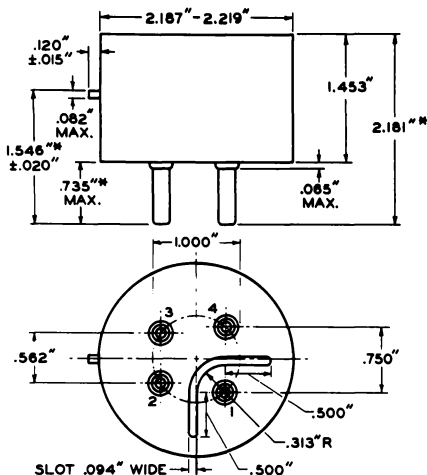
* Add 0.060" for solder on finished tube.



BASES

4-PIN TYPES

LARGE - SHELL SUPER-JUMBO 4 - PIN WITH BAYONET



JETEC No. B4-133
RCA No. 3982

*For other dimensions, see first page
of the "Super-Jumbo" series.*

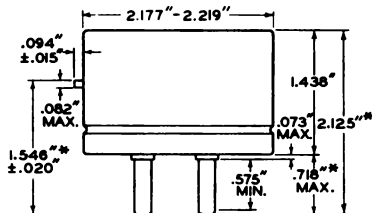
* Add 0.060" for solder on finished tube.



BASES

4-PIN TYPES

LARGE - METAL - SHELL SUPER-JUMBO 4-PIN WITH BAYONET



JETEC No. A4-18
RCA No. 4310

*For other dimensions, see first page
of the "Super-Jumbo" series.*

* Add 0.060" for solder on finished tube.

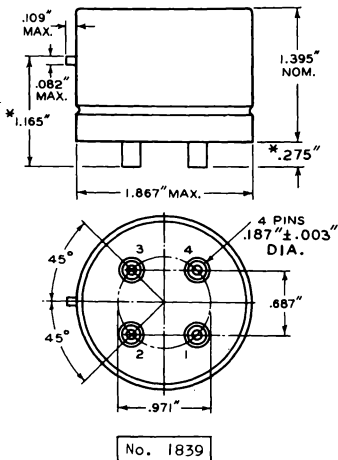


BASES

4-PIN TYPES

With Bottom View

JUMBO 4-PIN



* On finished tube, add .060" for solder.

Dec. 1, 1942

RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

BASES

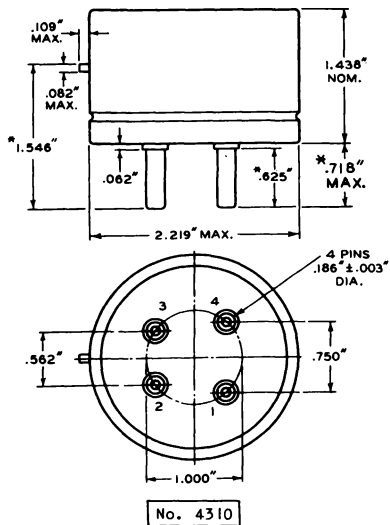


BASES

4-PIN TYPES

With Bottom View

SUPER-JUMBO 4-PIN



* on finished tube, add $.030''$ for solder.

Dec. 1, 1942

RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

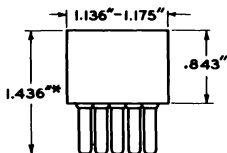
BASES



5-PIN TYPES

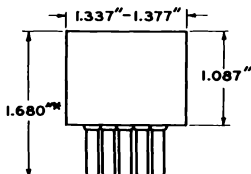
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL
SMALL 5-PIN



JETEC No. A5-6
RCA No. 5108

**MEDIUM-SHELL
SMALL 5-PIN**



JETEC No. A5-11
RCA No. 5106

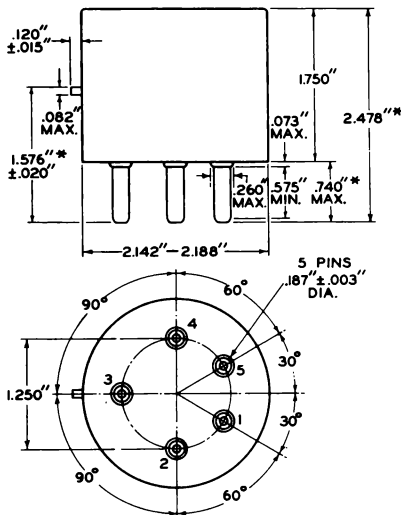
* Add 0.030" for solder on finished tube.



BASES

5-PIN TYPES

MEDIUM-SHELL GIANT 5-PIN WITH BAYONET



JETEC No. A5-19

RCA No. 5325

SPECIAL METAL-SHELL GIANT 5-PIN

See Tube Types 4-125A/4D21 and 4-250A/5D22

SPECIAL METAL-SHELL SUPER-GIANT 5-PIN

See Tube Type 4-1000A

* Add 0.030" for solder on finished tube.



BASES

5-PIN TYPES

SMALL-SHELL DUODECAL 5-PIN

*For details of this base, see corresponding
DUODECAL 12-PIN type*

DWARF-SHELL OCTAL 5-PIN

SMALL-SHELL OCTAL 5-PIN

SMALL-WAFER OCTAL 5-PIN

SMALL-WAFER OCTAL 5-PIN

WITH SLEEVE

INTERMEDIATE-SHELL OCTAL 5-PIN

SHORT INTERMEDIATE-SHELL OCTAL 5-PIN

SHORT INTERMEDIATE-SHELL OCTAL 5-PIN

WITH EXTERNAL BARRIERS

MEDIUM-SHELL OCTAL 5-PIN

SHORT JUMBO-SHELL OCTAL 5-PIN

*For details of above bases, see corresponding
OCTAL 8-PIN type*

SMALL RADIAL 5-PIN

See OUTLINES--Glass Types

MEDIUM-MOLDED-FLARE

SEPTAR 5-PIN

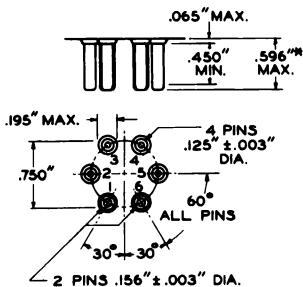
See Tube Type 4-65A



BASES

6-PIN TYPES

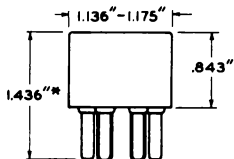
"SMALL 6-PIN" PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GA6-1) having thickness of 1/4" and six holes, two adjacent with diameters of $0.1650" \pm 0.0005"$ and four with diameters of $0.1360" \pm 0.0005"$ so located on a $0.7500" \pm 0.0005"$ diameter circle that the distance between any two adjacent hole centers is $0.3750" \pm 0.0005"$.

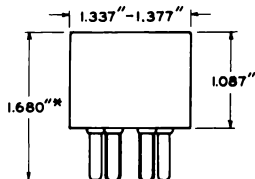
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL SMALL 6-PIN



JETEC No. A6-7
RCA No. 6108

MEDIUM-SHELL SMALL 6-PIN



JETEC No. A6-12
RCA No. 6106

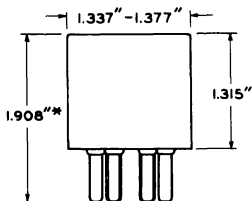
* Add 0.030" for solder on finished tube.



BASES

6-PIN TYPES

LONG MEDIUM-SHELL SMALL 6-PIN



RCA No. 6105

*For other dimensions, see first page
of the "Small 6-Pin" series.*

SMALL-SHELL DUODECAL 6-PIN

*For details of this base, see corresponding
DUODECAL 12-PIN type*

SMALL-SHELL OCTAL 6-PIN
INTERMEDIATE-SHELL OCTAL 6-PIN
SHORT INTERMEDIATE-SHELL OCTAL 6-PIN
SHORT INTERMEDIATE-SHELL OCTAL 6-PIN
WITH EXTERNAL BARRIERS
MEDIUM-SHELL OCTAL 6-PIN
SHORT JUMBO-SHELL OCTAL 6-PIN
SMALL-WAFER OCTAL 6-PIN
SMALL-WAFER OCTAL 6-PIN
WITH SLEEVE

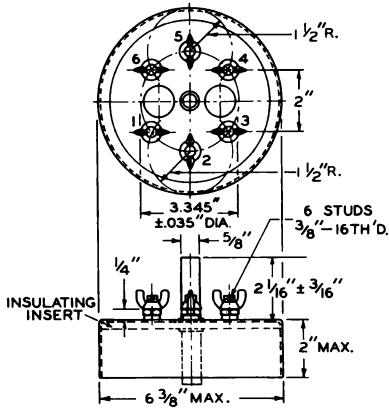
*For details of above bases, see corresponding
OCTAL-8 PIN type*

* Add 0.030" for solder on finished tube.



BASES

6-TERMINAL TYPES



SPACE FOR CONNECTOR
BETWEEN WING NUT AND
LOCK NUT IS $\frac{3}{16}$ " MAX.

JETEC No. FO-6

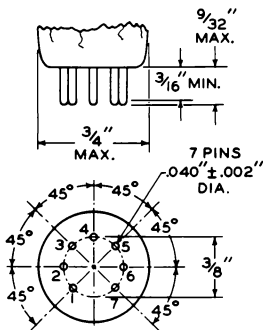
RCA No. 6628



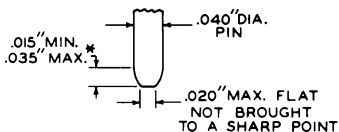
BASES

7-PIN TYPES

SMALL-BUTTON MINIATURE 7-PIN



Miniature Base Pin Contour



JETEC No. E7-1

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge (part of gauge JETEC No. GE7-1) having thickness of $1/4$ " and eight holes with diameters of $0.0520" \pm 0.0005"$ so located on a $0.3750" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.1434" \pm 0.0005"$.

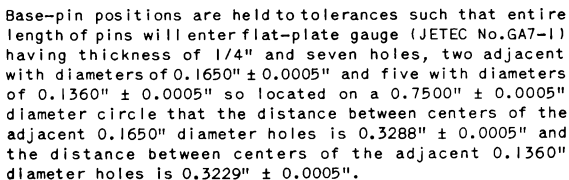
The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than $1/8$ " from the bottom of the seated tube.

* This dimension around the periphery of any individual pin may vary within the limits shown.



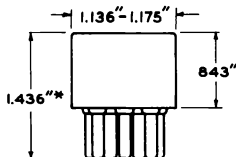
"SMALL 7-PIN"

PIN DIMENSIONS AND ORIENTATION



Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

**SMALL-SHELL
SMALL 7-PIN**



JETEC No. A7-8
RCA No. 7108

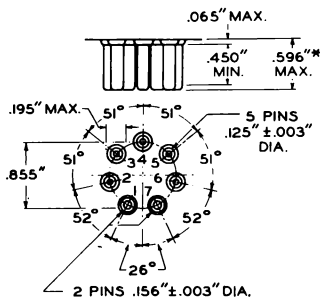
* Add 0.030* for solder on finished tube.



BASES

7-PIN TYPES

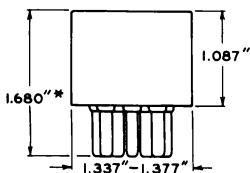
"MEDIUM 7-PIN" PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GA7-2) having thickness of 1/4" and seven holes, two adjacent with diameters of $0.1650" \pm 0.0005"$ and five with diameters of $0.1360" \pm 0.0005"$ so located on a $0.8550" \pm 0.0005"$ diameter circle that the distance between centers of the adjacent $0.1650"$ diameter holes is $0.3748" \pm 0.0005"$ and the distance between centers of the adjacent $0.1360"$ diameter holes is $0.3681" \pm 0.0005"$.

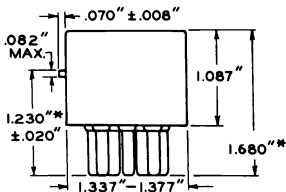
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

MEDIUM-SHELL MEDIUM 7-PIN



JETEC No. A7-13
RCA No. 7306

MEDIUM-SHELL MEDIUM 7-PIN WITH BAYONET



JETEC No. A7-14
RCA No. 7302

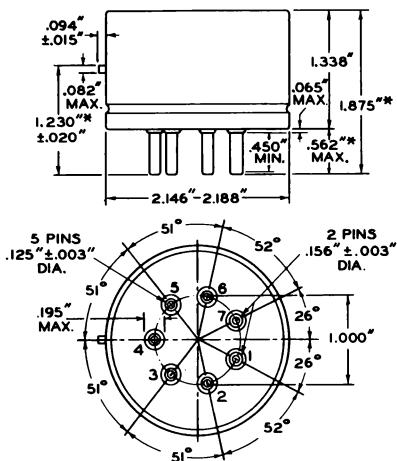
* Add 0.030" for solder on finished tube.



BASES

7-PIN TYPES

MEDIUM-METAL-SHELL GIANT 7-PIN WITH BAYONET



VENTILATED MEDIUM-METAL-SHELL GIANT 7-PIN

See Tube Type 4E27A/5-125B

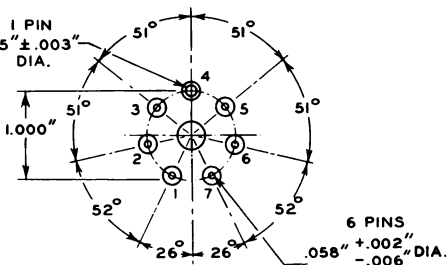
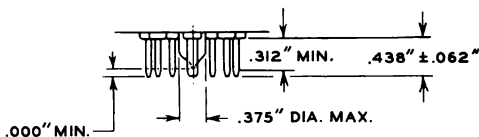
* Add 0.060" for solder on finished tube.



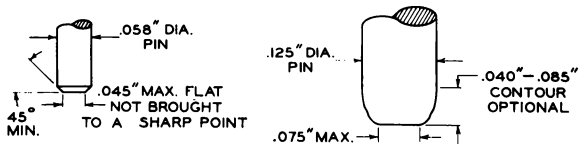
BASES

7-PIN TYPES

"SEPTAR 7-PIN" PIN DIMENSIONS AND ORIENTATION



Septar Base Pin Contour



Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge having thickness of $\frac{3}{8}$ " and seven holes, one with diameter of $0.1450" \pm 0.0005"$ and six with diameters of $0.0800" \pm 0.0005"$ located on a $1.0000" \pm 0.0005"$ diameter circle at specified angles with a tolerance of $\pm 5'$ for each angle. Gauge is also provided with a hole $0.500" \pm 0.010"$ concentric with pin circle.

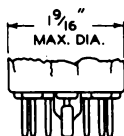
It is essential that the socket shall be constructed with floating-contact clips.



BASES

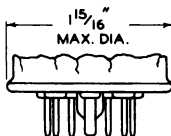
7-PIN TYPES

SMALL-BUTTON SEPTAR 7-PIN



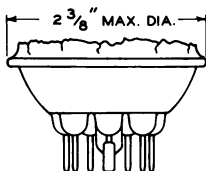
JETEC No. E7-26
RCA No. FSB710

SMALL-WAFER SEPTAR 7-PIN



JETEC No. E7-21
RCA No. FSB712

MEDIUM MOLDED-FLARE SEPTAR 7-PIN



JETEC No. E7-2
RCA No. FSB603

*For other dimensions of above bases, see first
page of the "Septar 7-Pin" series*



BASES

7-PIN TYPES

SMALL-SHELL DUODECAL 7-PIN

*For details of this base, see corresponding
DUODECAL 12-PIN type*

SMALL-SHELL OCTAL 7-PIN

INTERMEDIATE-SHELL OCTAL 7-PIN

SHORT INTERMEDIATE-SHELL OCTAL 7-PIN WITH EXTERNAL BARRIERS

MEDIUM-SHELL OCTAL 7-PIN

SHORT JUMBO-SHELL OCTAL 7-PIN

SMALL-WAFER OCTAL 7-PIN

SMALL-WAFER OCTAL 7-PIN WITH SLEEVE

*For details of above bases, see corresponding
OCTAL 8-PIN type*

SMALL RADIAL 7-PIN

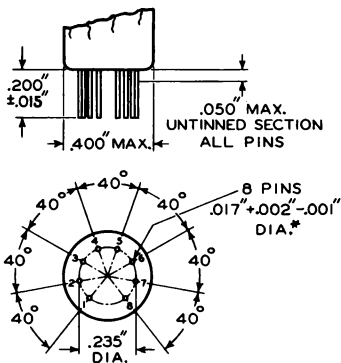
See OUTLINES--Glass Tubes



BASES

8-PIN TYPES

SMALL-BUTTON SUB-MINAR 8-PIN



JETEC No. E8-9

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge (part of gauge JETEC No. GE8-1) having thickness of $13/64$ " and nine holes with diameters of $0.0240" \pm 0.0005"$ so located on a $0.2350" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.0804" \pm 0.0005"$.

The design of the socket should be such that the point of bearing of the contacts on the base pins should not be closer than $0.050"$ from the bottom of the seated tube.

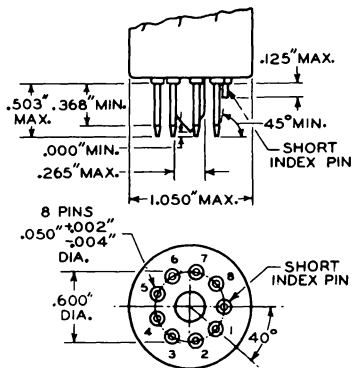
* The specified pin diameter applies only in the zone between $0.050"$ from the base seat and the end of the pin.



BASES

8-PIN TYPES

SMALL-BUTTON DITETRAR 8-PIN



JETEC No. E9-11
RCA No. FSB675

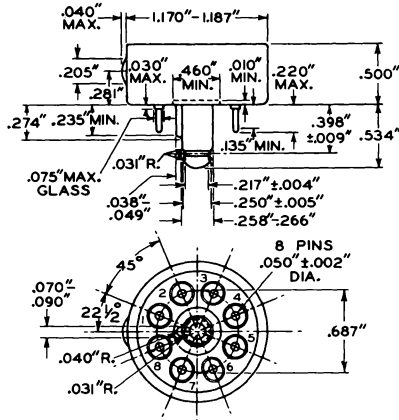
Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge having thickness of $1/4''$ and nine holes with diameters of $0.0700'' \pm 0.0005''$ so located on a $0.6000'' \pm 0.0005''$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2052'' \pm 0.0005''$. Gauge is also provided with a hole having diameter of $0.300'' \pm 0.001''$ concentric with the pin circle.



BASES

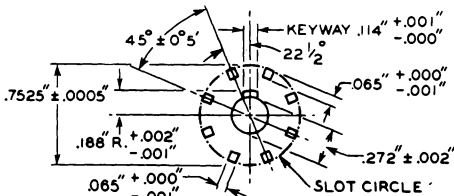
8-PIN TYPES

LOCK-IN 8-PIN



JETEC No. D8-1

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from gauge JETEC No. GD8-1. This gauge contains a flat-plate section having thickness of 1/4" and eight slots located and dimensioned as shown on the following diagram. Flat-plate section is also provided with a hole having diameter of $0.272" \pm 0.002"$ concentric with slot circle, and with a keyway as shown on the diagram.

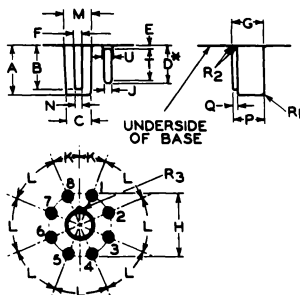




BASES

8-PIN TYPES

"OCTAL" PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	-	45°	-
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	-	-	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R ₁	-	.031"	-
G	.352"	.362"	.372"	R ₂	-	-	.050"
H	-	.687"	-	R ₃	-	.040"	-
J	.090"	.093"	.096"	T	.340"	-	-
K	-	22.5°	-	U	-	-	.135"

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. 688-1) having thickness of 1/4" and eight holes with diameters of $0.1030" \pm 0.0005"$ so located on a $0.6870" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2629" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 2 pounds will not be lifted when pins are withdrawn.

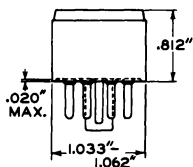
* Add 0.030" for solder on finished tube.



BASES

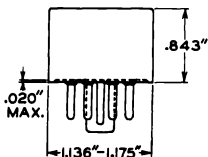
8-PIN TYPES

DWARF-SHELL OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
5-Pin	1, 3, 5, 7, 8	B5-45	-

SMALL-SHELL OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-1	8529
7-Pin	1, 2, 3, 4, 5, 7, 8	B7-2	7529
6-Pin	1, 2, 3, 5, 7, 8	B6-3	6529
5-Pin	1, 2, 4, 6, 8	B5-5	5529

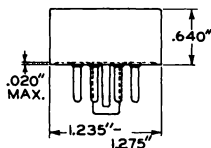
*For other dimensions of above bases, see first
page of the "Octal" series*



BASES

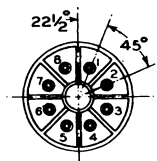
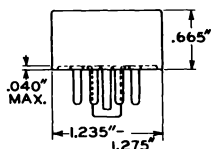
8-PIN TYPES

SHORT INTERMEDIATE-SHELL OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-46	8555
7-Pin	1, 2, 3, 4, 5, 7, 8	B7-47	7555
6-Pin	1, 2, 3, 5, 7, 8	B6-48	6555
5-Pin	1, 2, 4, 6, 8	B5-49	5555

SHORT INTERMEDIATE-SHELL OCTAL WITH EXTERNAL BARRIERS



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-58	8565
7-Pin	1, 2, 3, 4, 5, 7, 8	B7-59	7565
6-Pin	1, 2, 3, 5, 7, 8	B6-60	6565
5-Pin	1, 2, 4, 6, 8	B5-62	5565

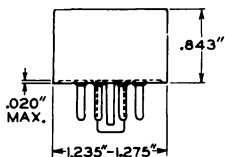
*For other dimensions of above bases, see first
page of the "Octal" series*



BASES

8-PIN TYPES

INTERMEDIATE-SHELL OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-6	8537
7-Pin	1, 2, 3, 4, 5, 7, 8	B7-7	7537
6-Pin	1, 2, 3, 5, 7, 8	B6-8	6537
6-Pin	2, 3, 4, 5, 7, 8	B6-81	-
5-Pin	1, 2, 4, 6, 8	B5-10	5537
5-Pin	2, 3, 5, 7, 8	B5-82	-

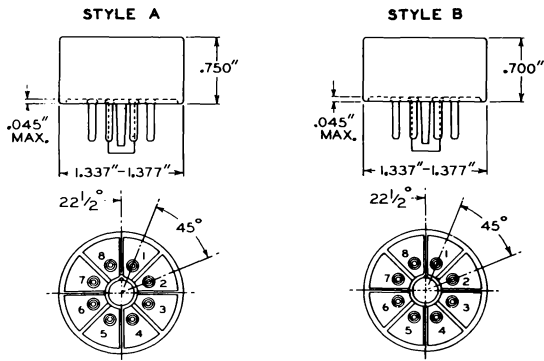
*For other dimensions, see first page
of the "Octal" series*



BASES

8-PIN TYPES

SHORT MEDIUM-SHELL OCTAL WITH EXTERNAL BARRIERS



No. of Pins	Pins	Style	JETEC No.	RCA No.
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	A	B8-110	-
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B	B8-118	8564
7-Pin	1, 2, 3, 4, 5, 7, 8	A	B7-111	-
7-Pin	1, 2, 3, 4, 5, 7, 8	B	B7-119	7564
6-Pin	1, 2, 3, 5, 7, 8	A	B6-112	-
6-Pin	1, 2, 3, 5, 7, 8	B	B6-120	6564
6-Pin	2, 3, 4, 5, 7, 8	A	B6-148	-
6-Pin	2, 3, 4, 5, 7, 8	B	B6-122	6764
5-Pin	1, 2, 4, 6, 8	A	B5-113	-
5-Pin	1, 2, 4, 6, 8	B	B5-121	5564
5-Pin	2, 3, 5, 7, 8	A	B5-149	-
5-Pin	2, 3, 5, 7, 8	B	B5-123	5764

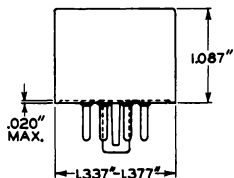
For other dimensions, see first page
of the "Octal" series



BASES

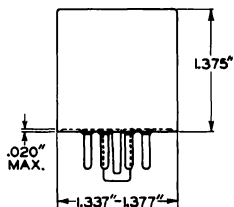
8-PIN TYPES

MEDIUM-SHELL OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	88-11	8533
7-Pin	1, 2, 3, 4, 5, 7, 8	87-12	7533
6-Pin	1, 2, 3, 5, 7, 8	86-13	6533
5-Pin	1, 2, 4, 6, 8	85-15	5533

LONG MEDIUM-SHELL OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	88-65	8545
5-Pin	2, 3, 5, 7, 8	85-80	5545

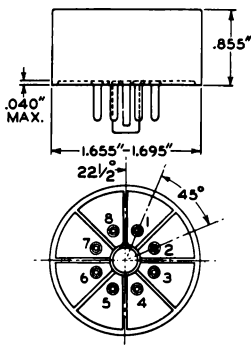
For other dimensions of above bases, see first page of the "Octal" series



BASES

8-PIN TYPES

SHORT JUMBO-SHELL OCTAL WITH EXTERNAL BARRIERS



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-71	8556
7-Pin	1, 2, 3, 4, 5, 7, 8	B7-72	7556
6-Pin	1, 2, 3, 5, 7, 8	B6-73	6556
5-Pin	1, 2, 4, 6, 8	B5-74	5556

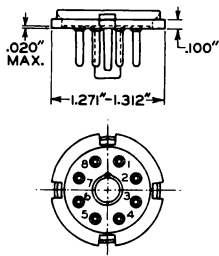
*For other dimensions, see first page
of the "Octal" series*



BASES

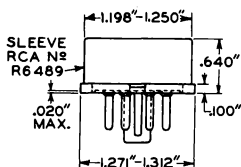
8-PIN TYPES

SMALL-WAFER OCTAL



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-21	8527
7-Pin	1, 2, 3, 4, 5, 7, 8	B7-22	7527
6-Pin	1, 2, 3, 5, 7, 8	B6-23	6527
5-Pin	1, 2, 4, 6, 8	B5-25	5527

SMALL-WAFER OCTAL WITH SHORT SLEEVE



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-44	-

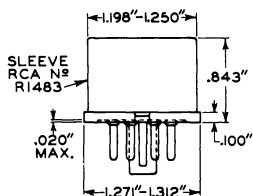
For other dimensions of above bases, see first page of the "Octal" series



BASES

8-PIN TYPES

SMALL-WAFER OCTAL WITH SLEEVE



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	88-26	-
7-Pin	1, 2, 3, 4, 5, 7, 8	87-27	-
6-Pin	1, 2, 3, 5, 7, 8	86-28	-
5-Pin	1, 2, 4, 6, 8	85-30	-

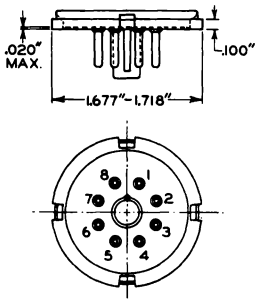
*For other dimensions, see first page
of the "Octal" series*



BASES

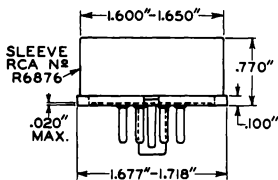
8-PIN TYPES

LARGE-WAFER OCTAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-32	8534

LARGE-WAFER OCTAL WITH SLEEVE



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-86	-

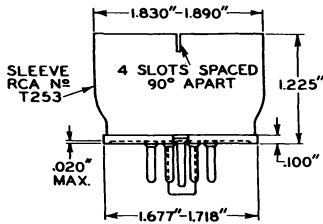
*For other dimensions of above bases, see first
page of the "Octal" series*



BASES

8-PIN TYPES

LARGE-WAFER OCTAL WITH FLARED SLEEVE



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	—	—

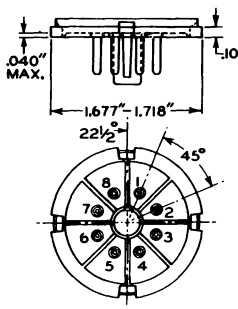
*For other dimensions, see first page
of the "Octal" series*



BASES

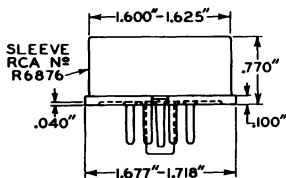
8-PIN TYPES

LARGE-WAFER OCTAL WITH EXTERNAL BARRIERS



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-94	8554

LARGE-WAFER OCTAL WITH EXTERNAL BARRIERS AND SLEEVE



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
8-Pin	1, 2, 3, 4, 5, 6, 7, 8	B8-98	-

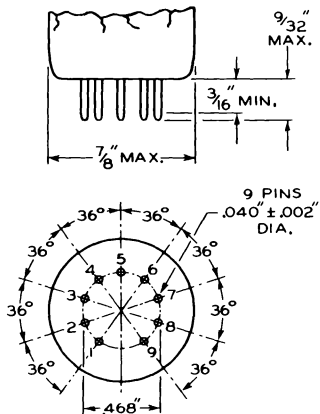
For other dimensions of above bases, see first page of the "Octal" series



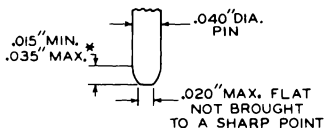
BASES

9-PIN TYPES

SMALL-BUTTON NOVAL 9-PIN



Noval Base Pin Contour



JETEC No. E9-1

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from gauge JETEC No. GE9-1. This gauge contains a flat-plate section having thickness of 1/4" and ten holes with diameters of $0.0520" \pm 0.0005"$ so located on a $0.4680" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.1446" \pm 0.0005"$.

The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 1/8" from the bottom of the seated tube.

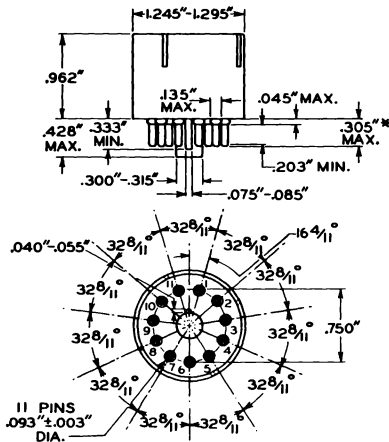
* This dimension around the periphery of any individual pin may vary within the limits shown.



BASES

11-PIN TYPES

SMALL-SHELL NEOSUBMAGNAL 11-PIN



JETEC No. B11-104
RCA No. 11442

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of $1/4$ " and eleven holes with diameters of $0.1030" \pm 0.0005"$ so located on a $0.7500" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2113" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

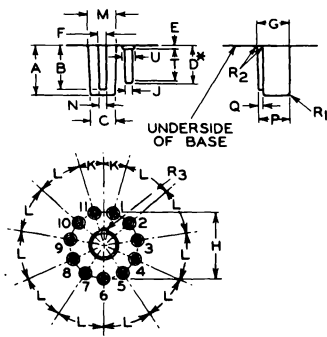
* Add 0.030" for solder on finished tube.



BASES

11-PIN TYPES

"SUBMAGNAL" PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	—	32-8/11°	—
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	—	—	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R ₁	—	.031"	—
G	.352"	.362"	.372"	R ₂	—	—	.050"
H	—	.750"	—	R ₃	—	.040"	—
J	.090"	.093"	.096"	T	.340"	—	—
K	—	16-4/11°	—	U	—	—	.135"

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB11-2) having thickness of 1/4" and eleven holes with diameters of $0.1030" \pm 0.0005"$ so located on a $0.7500" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2113" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

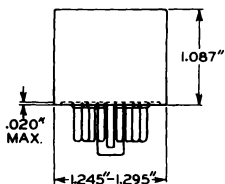
* Add 0.030" for solder on finished tube.



BASES

11-PIN TYPES

SMALL-SHELL SUBMAGNAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
11-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	B11-88	11344

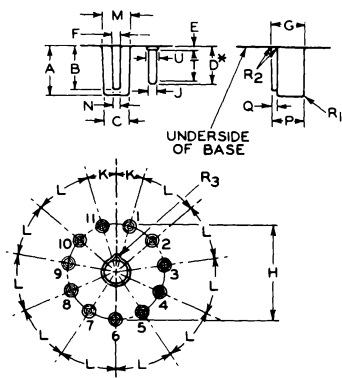
*For other dimensions, see first page
of the "Submagnal" series*



BASES

11-PIN TYPES

"MAGNAL" PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	—	32-8/11°	—
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	—	—	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R ₁	—	.031"	—
G	.352"	.362"	.372"	R ₂	—	—	.050"
H	—	1.063"	—	R ₃	—	.040"	—
J	.090"	.093"	.096"	T	.340"	—	—
K	—	16-4/11°	—	U	—	—	.135"

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB11-1) having thickness of 1/4" and eleven holes with diameters of $0.1030" \pm 0.0005"$ so located on a $1.0630" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2995" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

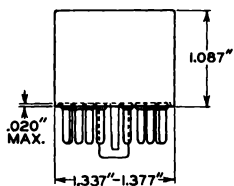
* Add 0.030" for solder on finished tube.



BASES

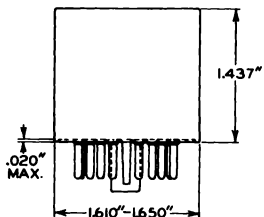
11-PIN TYPES

SMALL-SHELL MAGNAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
11-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	B11-33	11247

MEDIUM-SHELL MAGNAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
11-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	B11-66	11248

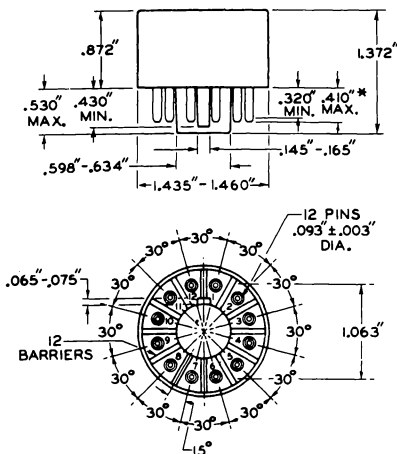
*For other dimensions of above bases, see first
page of the "Magnal" series*



BASES

12-PIN TYPES

DWARF-SHELL DUODECAL



No. of Pins	Pins	JETEC No.	RCA No.
12-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	B12-157	-
6-Pin	1, 2, 3, 10, 11, 12	B6-158	6353

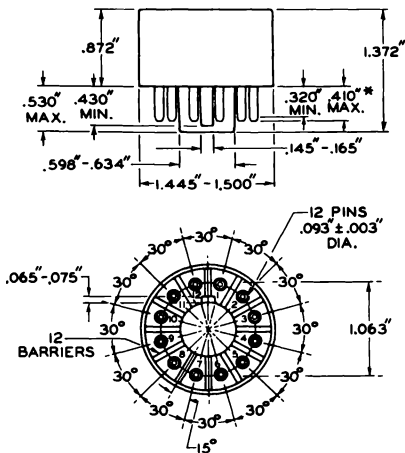
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB12-1) having thickness of 1/4" and twelve holes with diameters of $0.1030" \pm 0.0005"$ so located on a $1.0630" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2751" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.



SMALL-SHELL DUODECAL



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
12-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	B12-43	12253
10-Pin	1, 2, 3, 4, 6, 7, 8, 9, 10, 12	B10-75	10253
7-Pin	1, 2, 6, 7, 10, 11, 12	B7-51	7253
6-Pin	1, 2, 6, 10, 11, 12	B6-63	6253
5-Pin	1, 2, 10, 11, 12	B5-57	5253

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB12-1) having thickness of 1/4" and twelve holes with diameters of $0.1030" \pm 0.0005"$ so located on a $1.0630" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2751" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

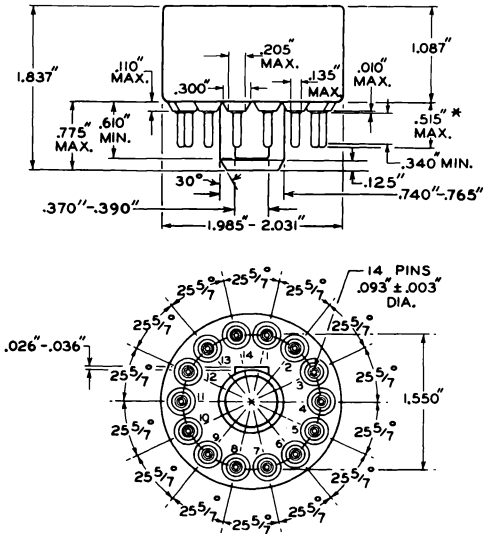
* Add 0.030" for solder on finished tube.



BASES

14-PIN TYPES

SMALL-SHELL NEODIHEPTAL



No. of Pins	Pins	JETEC No.	RCA No.
14-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	B14-130	14560
12-Pin	1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 14	B12-131	12560

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB14-2) having thickness of 1/4" and fourteen holes with diameters of $0.1030" \pm 0.0005"$ so located on a $1.5500" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.3449" \pm 0.0005"$.

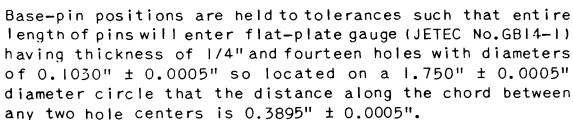
Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.



"DIHEPTAL"

PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

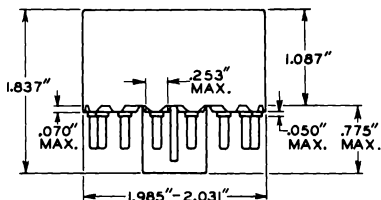
JULY 1, 1955



BASES

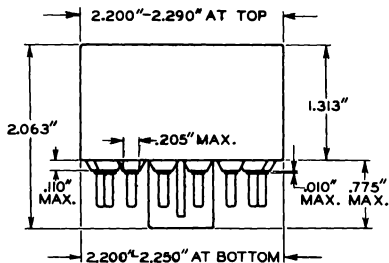
14-PIN TYPES

SMALL-SHELL DIHEPTAL



No. of Pins	Pins	JETEC No.	RCA No.
14-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	B14-45	14151
12-Pin	1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 14	B12-105	12151

MEDIUM-SHELL DIHEPTAL



No. of Pins	Pins	JETEC No.	RCA No.
14-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	B14-38	14146
12-Pin	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14	B12-37	12146

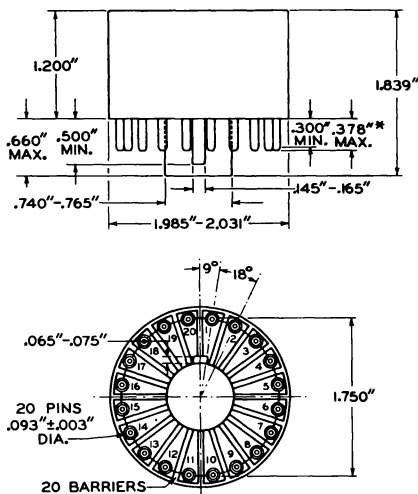
For other dimensions of above bases, see first page of the "Diheptal" series



BASES

20-PIN TYPES

SMALL-SHELL BIDEAL



No. of Pins	Pins	JETEC No.	RCA No.
20-Pin	1 through 20	B20-102	20158

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB20-1) having thickness of 1/4" and twenty holes with diameters of $0.1030" \pm 0.0005"$ so located on a $1.7500" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2738" \pm 0.0005"$.

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

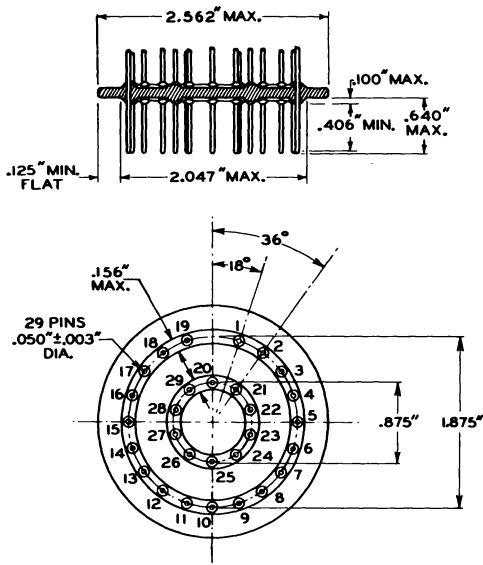
* Add 0.030" for solder on finished tube.



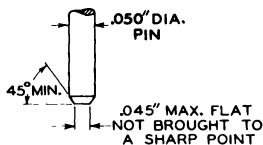
BASES

29-PIN TYPES

SMALL-BUTTON TWENTYNINAR



Twentyninar Base Pin Contour



No. of Pins	Pins	JETEC No.	RCA No.
29-Pin	1 through 29	E29-17	-
22-Pin	1 through 19, 21, 25, 28	E22-16	FSB693
8-Pin	2, 6, 10, 14, 18, 21, 25, 28	E8-19	FSB693A



BASES

29-PIN TYPES

SMALL-BUTTON TWENTYNINAR (CONT'D)

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of $3/8$ " and twenty-nine holes with diameters of $0.0700" \pm 0.0005"$, nineteen of which are located with hole centers corresponding to the specified location of pin centers on a $1.8750" \pm 0.0005"$ diameter circle, and ten of which are located with hole centers corresponding to the specified location of pin centers on a $0.8750" \pm 0.0005"$ diameter circle concentric with the $1.8750"$ circle.

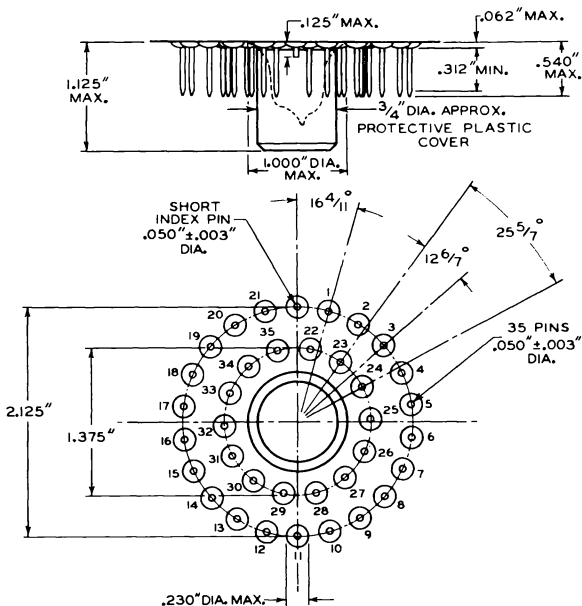
Pin fit in gauge is such that entire length of pins will, without undue force, enter into and disengage from the gauge.



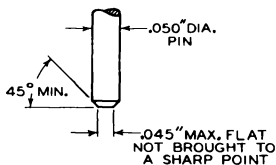
BASES

35-PIN TYPES

"THIRTYFIVAR" PIN DIMENSIONS AND ORIENTATION



Thirtyfivar Base Pin Contour



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of $3/8$ " and thirty-six holes with diameters of $0.0700" \pm 0.0005$ ", twenty-two of which are located with hole centers corresponding to the specified location of



BASES

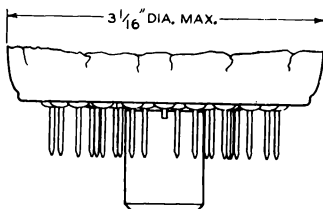
35-PIN TYPES

THIRTYFIVAR (CONT'D)

pin centers on a $2.1250'' \pm 0.0005''$ diameter circle, and fourteen of which are located with hole centers corresponding to the specified location of pin centers on a $1.3750'' \pm 0.0005''$ diameter circle concentric with the $2.1250''$ circle.

Pin fit in gauge is such that entire length of pins will, without undue force, enter into and disengage from the gauge. Gauge is also provided with a hole $1.000''$ diameter minimum concentric with pin circles.

SMALL-BUTTON THIRTYFIVAR



<i>No. of Pins</i>	<i>Pins</i>	<i>JETEC No.</i>	<i>RCA No.</i>
35-Pin	1 through 35	E35-28	-
33-Pin	Omit pins 24 and 30	E33-29	-
31-Pin	Omit pins 24 and 30; pins 23 and 31 are trimmed to same di- mension as index pin.	E31-36	-

*For other dimensions of above base, see first
page of the "Thirtyfivar" series*



DEFINITIONS ■

Amplification Factor (μ) is a special case of mu-factor. It is the ratio of the change in plate voltage to a change in control-electrode voltage under the conditions that the plate current remains unchanged and that all other electrode voltages are maintained constant. It is a measure of the effectiveness of the control-electrode voltage relative to that of the plate voltage upon the plate current. The sense is usually taken as positive when the voltages are changed in opposite directions. As most precisely used, the term amplification factor refers to infinitesimal changes. 1E62

Class A Amplifier: * An amplifier in which the grid bias and the alternating grid voltages are such that plate current in a specific tube flows at all times. 1E69

The ideal class A amplifier is one in which the alternating component of the plate current is an exact reproduction of the form of the alternating grid voltage, and the plate current flows during the 360 electrical degrees of the cycle. The characteristics of a class A amplifier are low efficiency and output.

Class AB Amplifier: * An amplifier in which the grid bias and alternating grid voltages are such that plate current in a specific tube flows for appreciably more than half but less than the entire electrical cycle. 1E70

The characteristics of a class AB amplifier are efficiency and output intermediate to those of a class A and a class B amplifier. The idle plate current and attendant dissipation may be made substantially less than is possible with class A amplifiers. This amplifier has been called class A prime.

■ Definitions taken from the 1933 Report of the Standards Committee of the I.R.E. are followed by the definition number in the report.

* To denote that grid current does not flow during any part of the input cycle, the suffix 1 may be added to the letter or letters of the class identification. The suffix 2 may be used to denote that grid current flows during some part of the cycle.



DEFINITIONS

(continued from preceding page)

Class B Amplifier:* An amplifier in which the grid bias is approximately equal to the cutoff value so that the plate current is approximately zero when no exciting grid voltage is applied and so that plate current in a specific tube flows for approximately one half of each cycle when an alternating grid voltage is applied. 1E71

The ideal class B amplifier is one in which the alternating component of plate current is an exact replica of the alternating grid voltage for the half cycle when the grid is positive with respect to the bias voltage, and the plate current flows during 180 electrical degrees of the cycle. The characteristics of a class B amplifier are medium efficiency and output.

Class C Amplifier:* An amplifier in which the grid bias is appreciably greater than the cutoff value so that the plate current in each tube is zero when no alternating grid voltage is applied, and so that plate current in a specific tube flows for appreciably less than one half of each cycle when an alternating grid voltage is applied. 1E72

Class C amplifiers find application where high plate-circuit efficiency is a paramount requirement and where departure from linearity between input and output is permissible. The characteristics of a class C amplifier are high plate-circuit efficiency and high power output.

Control-Grid—Plate Transconductance (g_m) is the name for the plate-current-to-control-grid-voltage transconductance. This is ordinarily the most important transconductance and is commonly understood when the term "transconductance" is used. 1E56

Formerly it was known as mutual conductance. See definition of Transconductance.

Conversion Transconductance (g_c) is the quotient

* See preceding page.



DEFINITIONS

(continued from preceding page)

of the magnitude of a single beat-frequency component ($f_1 + f_2$) or ($f_1 - f_2$) of the output-electrode current by the magnitude of the control-electrode voltage of frequency f_1 , under the conditions that all direct electrode voltages and the magnitude of the electrode alternating voltage f_2 remain constant and that no impedances at the frequencies f_1 or f_2 are present in the output circuit. As most precisely used, the term refers to infinitesimal changes. 1E60

When the performance of a frequency converter is determined, conversion transconductance is used in the same way as transconductance is used in single-frequency amplifier computations.

Deflection Factor of a cathode-ray oscillograph tube is the reciprocal of the deflection sensitivity. 3E11

Deflection Sensitivity of a cathode-ray oscillograph tube is the quotient of the displacement of the electron beam at the place of impact by the change in the deflecting field. It is usually expressed in millimeters per volt applied between the deflecting electrodes or in millimeters per gauss of the deflecting magnetic field. 3E10

Direct Capacitance between two electrodes in a multielectrode tube is the ratio of the charge placed on either electrode to its resulting change in potential above the other electrode when all remaining ($n-2$) electrodes are at the potential of the first electrode, the charge placed on the second electrode being equal to the sum of the charges placed on all the other electrodes.

Electrode Current is the current passing to or from an electrode through the vacuous space. 1E39

The terms grid current, anode current, plate current, etc., are used to designate currents passing to or from these specific electrodes.

Electrode Dissipation is the power dissipated in the



DEFINITIONS

(continued from preceding page)

form of heat by an electrode as a result of electron and/or ion bombardment. 1E46

Electrode Voltage is the voltage between an electrode and a specified point of the cathode. 1E40

The terms grid voltage, anode voltage, plate voltage, etc., are used to designate the voltage between these specific electrodes and the cathode.

Gas Amplification Factor of a phototube is the factor of increase in the sensitivity of a gas phototube due solely to the ionization of the contained gas. For a gas phototube having a structure such as to permit saturation to occur at a voltage (approximately 25 volts) less than that causing appreciable ionization, the gas amplification factor at a specified operating voltage is the ratio of the sensitivity measured at that voltage to the sensitivity measured at the saturation voltage. 4E5

Grid Driving Power is the average product of the instantaneous value of the grid current and of the alternating component of the grid voltage over a complete cycle. This comprises the power supplied to the biasing device and to the grid. 1E42

Input Capacitance of a vacuum tube is the sum of the direct capacitances between the control grid and the cathode and such other electrodes as are operated at the alternating potential of the cathode. This is not the effective input capacitance, which is a function of the impedances of the associated circuits. 1E67

Modulation Factor in an amplitude-modulated wave is the ratio of half the difference between the maximum and minimum amplitudes to the average amplitude.

In linear modulation the average amplitude of the envelope is equal to the amplitude of the unmodulated wave, provided there is no zero-frequency com-



DEFINITIONS

(continued from preceding page)

ponent in the modulating signal wave (as in telephony). For modulating signal waves having unequal positive and negative peaks, positive and negative modulation factors may be defined as the ratios of the maximum departures (positive and negative) of the envelope from its average value to its average value. (See Percentage Modulation.)

1T-39

Mu-Factor (μ -factor) is the ratio of the change in one electrode voltage to the change in another electrode voltage, under the conditions that a specified current remains unchanged and that all other electrode voltages are maintained constant. It is a measure of the relative effect of the voltages on two electrodes upon the current in the circuit of any specified electrode. As most precisely used, the term μ -factor refers to infinitesimal changes. 1E61

Output Capacitance of a vacuum tube is the sum of the direct capacitances between the output electrode (usually the plate) and the cathode and such other electrodes as are operated at the alternating potential of the cathode. This is not the effective output capacitance, which is a function of the impedances of the associated circuits. 1E68

Peak Forward Plate Voltage is the maximum instantaneous plate voltage in the direction in which the tube is designed to pass current. 1E43

Peak Inverse Plate Voltage is the maximum instantaneous plate voltage in the direction opposite to that in which the tube is designed to pass current. 1E44

Peak Plate Current is the maximum instantaneous plate current passing recurrently through the tube in the direction of normal current flow.

Percentage Modulation is the modulation factor expressed in per cent. 1T-40

Plate Resistance is the quotient of the alternating



DEFINITIONS

(continued from preceding page)

plate voltage by the in-phase component of the alternating plate current, all other electrode voltages being maintained constant. This is the effective parallel resistance and is not the real component of the electrode impedance. As most precisely used, the term refers to infinitesimal amplitudes.

Sensitivity of a phototube is basically defined as the quotient of the current through the tube by the radiant flux received by the cathode. The term "radiant flux" includes both visible radiation (light) and invisible infra-red and ultra-violet radiation. When stated in accordance with this basic definition, sensitivity is usually given in terms of microamperes per microwatt of radiant flux.

For convenience, sensitivity is frequently stated in terms of visible radiation only, and is then known as **Luminous Sensitivity**. When so stated, it is usually expressed in terms of microamperes per lumen of light flux, and depends on the color of the light or the spectral distribution of the radiant flux used to excite the phototube.

2870 Tungsten Sensitivity is the luminous sensitivity when the incident luminous flux is produced by a tungsten-filament lamp at a color temperature of 2870 degrees Kelvin.

When a phototube is used under steady illumination, its luminous sensitivity is known as **Static Luminous Sensitivity**. This is defined as the direct anode current produced by the light flux divided by the incident light flux of constant value.

When the light input to a phototube varies, as at audio frequency in sound reproduction, the luminous sensitivity is identified as **Dynamic Sensitivity**, and may be conveniently defined as the quotient of the amplitude of variation in anode current to the amplitude of variation in light input.

In high-vacuum phototubes, the dynamic sensitivity



DEFINITIONS

(continued from preceding page)

is ordinarily independent of frequency. In gas phototubes, the dynamic sensitivity falls off at the higher frequencies because there is a time lag between the current component produced by the secondary electrons resulting from excited atoms and positive ions arriving at the cathode. As the phase difference between these two components increases with increasing frequency of light variation, the net current variation decreases with consequent reduction in sensitivity. In the application of gas phototubes to audio frequencies, this effect is relatively unimportant but can be compensated for, if desired, in the design of the associated amplifier.

In the design of equipment utilizing phototubes, consideration should always be given to the effect of the time constant of the circuit consisting of the phototube and its associated load in reducing the performance capability of the phototube with increasing frequency.

Transconductance from one electrode to another is the quotient of the in-phase component of the alternating current of the second electrode by the alternating voltage of the first electrode, all other electrode voltages being maintained constant. As most precisely used, the term refers to infinitesimal amplitudes.

1E55

Tube Voltage Drop in a gas or vapor-filled tube is the plate voltage during the conducting period.

1E45

**RCA TUBE
HANDBOOK
HB-3**

**CATHODE-RAY
TUBE
SECTION**



CATHODE-RAY TUBES

This section pertains to RCA tubes for signal-to-image, image-to-signal, and image-to-image applications. It includes data on cathode-ray tubes for oscillographic and picture-reproduction use, camera tubes for television pickup, and monoscopes for testing the performance of television equipment.

*For further Technical Information, write to
Commercial Engineering, Tube Department,
Radio Corporation of America, Harrison, N. J.*



PRICES[□] OF CATHODE-RAY TUBE TYPES

Type	Schedule D [●]	Schedule D [●]	Type	Schedule D [●]	Schedule D [●]
2AP1-A [●]	-	\$ 10.55	12DP7-B....	-	\$ 72.50
2BP1.....	-	9.60	12KP4-A [●] ...	\$39.50	-
2BP11.....	-	11.00	12LP4.....	-	●
2F21.....	-	105.00	12LP4-A....	32.00	-
3AP1-A [●]	-	15.75	12SP7.....	-	47.40
3BP1-A.....	-	16.50	14CP4 [●]	35.00	-
3JP1.....	-	19.00	14EP4.....	35.00	-
3JP7.....	-	23.00	16ADP7.....	-	55.00
3KP1.....	-	14.50	16AP4-A....	46.00	-
3KP4 [●]	\$20.00	-	16DP4-A [●] ...	39.00	-
3KP11.....	-	16.50	16GP4.....	46.00	-
3MP1.....	-	14.75	16GP4-A....	-	●
3RP1.....	-	14.50	16GP4-B....	46.00	-
5BP1-A [●]	-	22.50	16GP4-C....	-	●
5CP1-A.....	-	23.25	16KP4 [●]	37.00	-
5CP7-A.....	-	27.25	16LP4-A [●] ...	40.00	-
5CP11-A.....	-	27.50	16RP4 [●]	37.00	-
5CP12.....	-	27.00	16TP4 [●]	37.00	-
5FP4-A.....	-	41.75	16WP4-A [●] ...	40.00	-
5FP7-A.....	-	30.25	17BP4-A....	36.00	-
5FP14.....	-	30.25	17CP4.....	35.00	-
5TP4.....	60.00	-	17GP4.....	46.00	-
5UP1.....	-	17.75	17HP4.....	38.25	-
5UP7.....	-	20.25	17JP4.....	36.00	-
5UP11.....	-	22.00	17LP4.....	38.25	-
5WP11.....	-	70.00	17QP4.....	36.00	-
5WP15.....	-	70.00	17TP4.....	36.50	-
5ZP16.....	-	71.25	19AP4.....	-	●
7BP7-A.....	-	48.50	19AP4-A....	59.00	-
7CP1.....	-	30.75	19AP4-B....	59.00	-
7DP4.....	31.50	-	19AP4-D....	-	●
7JP1.....	-	23.50	20CP4.....	51.50	-
7JP4.....	26.00	-	20MP4.....	54.00	-
7MP7.....	-	39.50	21AP4.....	55.00	-
7MP14.....	-	39.50	21MP4.....	57.00	-
7NP4.....	-	600.00	902-A [●]	-	12.50
7OP4.....	-	39.50	905-A [●]	-	65.25
7TP4.....	-	52.00	908-A [●]	-	16.50
7VP1.....	-	25.00	912.....	-	155.00
7WP4.....	-	630.00	913 [●]	-	15.50
9AP4.....	-	●	914-A.....	-	93.50
10BP4.....	-	●	1850-A.....	-	540.00
10BP4-A....	28.00	-	5527.....	-	49.90
10FP4-A [●] ...	35.00	-	5820.....	-	1200.00
10KP7.....	-	50.00	5826.....	-	1300.00
10SP4.....	-	54.00	6198.....	-	360.00
12AP4*.....	-	●			

● discontinued type. Data sheet has been retained in book for reference purpose only.

□, ●, ▲, ●, * : See next page.

APRIL 1, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CATHODE-RAY TUBE
PRICES



PRICES[□] OF CATHODE-RAY TUBE TYPES

- This price list applies only in the United States of America and is subject to change without notice. All prices are exclusive of all Federal, State and local excise, sales, and similar taxes.
- Schedule D shows list prices for tube types priced for distribution through dealer and service channels.
- ▲ Schedule U shows list prices for tube types priced for distribution through other than dealer and service channels.
- ♣ Not recommended for new equipment design.
- * For data see 9AP4/1804-P4 and 12AP4/1803-P4, respectively.

INFORMATION ON PURCHASING ABOVE TYPES

Information as to where *RCA Cathode-Ray Tube Types* can be purchased may be obtained from our regional office nearest you or from Tube Department, Radio Corporation of America, Harrison, N.J.



CLASSIFICATION CHART FOR TYPES IN CATHODE-RAY TUBE SECTION

When choosing tube types, the equipment designer should refer to the RCA PREFERRED TYPES LIST and its companion list - TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN - both of which appear in the General Section.

KINESCOPIES						
Envelope	Focusing Method	Deflection Method	Aluminized Screen	Minimum Screen Size Inches	Max. Ultor Volts®	TUBE TYPE
Direct-Viewing						
<i>Black & White</i>						
Ⓒ	E	M	No	6 Dia.	8000	7DP4
Ⓒ	E	E	No	6 Dia.	6000	7JP4
Ⓒ	M	M	No	9-1/8 Dia.	12000	10BP4-A
Ⓒ	M	M	Yes	9-1/8 Dia.	12000	10FP4-A
Ⓒ	M	M	Yes	11-1/8 Dia.	12000	12KP4-A
Ⓒ	M	M	No	11 Dia.	12000	12LP4-A
Ⓔ	M	M	No	11-3/8 x 8-1/2	14000	14EP4/ 14CP4
Ⓔ	E	M	No	11-3/8 x 8-1/2	14000	14HP4
Ⓜ	M	M	No	14-3/8 Dia.	14000	16AP4-A
Ⓒ	M	M	No	14-1/2 Dia.	15000	16DP4-A
Ⓜ	M	M	No	14-3/8 Dia.	14000	16GP4-B
Ⓒ	M	M	No	14-1/2 Dia.	14000	16LP4-A
Ⓔ	M	M	No	13-1/2 x 10-1/8	16000	16RP4/ 16KP4
Ⓔ	M	M	Yes	13-1/2 x 10-1/8	16000	16RP4-A/ 16KP4-A
Ⓔ	M	M	No	13-1/2 x 10-1/8	14000	16TP4
Ⓒ	M	M	No	14-1/2 Dia.	16000	16WP4-A
Ⓔ	E	M	No	14-1/4 x 10-3/4	16000	17AVP4
Ⓔ	E	M	Yes	14-1/4 x 10-3/4	16000	17AVP4-A
Ⓔ	M	M	No	14-1/4 x 10-3/4	16000	17BP4-A
Ⓔ	M	M	Yes	14-1/4 x 10-3/4	16000	17BP4-B
Ⓜ	M	M	No	14-3/8 x 10-11/16	16000	17CP4
Ⓜ	E	M	No	14-3/8 x 10-11/16	16000	17GP4
Ⓔ	E	M	No	14-1/4 x 10-3/4	16000	17HP4/ 17RP4
Ⓔ	E	M	Yes	14-1/4 x 10-3/4	16000	17HP4-B
Ⓔ	M	M	No	14-1/4 x 10-3/4	18000	17JP4
Ⓔ	E	M	Yes	14-1/4 x 10-3/4	16000	17LP4/ 17VP4
Ⓔ	E	M	Yes	14-1/4 x 10-3/4	16000	17LP4-A
Ⓔ	M	M	No	14-1/4 x 10-3/4	16000	17QP4
Ⓔ	M	M	Yes	14-1/4 x 10-3/4	18000	17QP4-A
Ⓜ	E	M	No	14-3/8 x 10-11/16	16000	17TP4
Ⓜ	M	M	No	17-1/4 Dia.	16000	19AP4-B

• Design-center values.

Ⓔ = Glass rectangular.

Ⓒ = Glass round.

E = Electrostatic.

Ⓜ = Metal rectangular.

Ⓜ = Metal round.

M = Magnetic.



CLASSIFICATION CHART FOR TYPES IN CATHODE-RAY TUBE SECTION

KINESCOPES (Cont'd)

Envelope	Focusing Method	Deflection Method	Aluminized Screen	Minimum Screen Size Inches	Max. Ultor Volts*	TUBE TYPE
Direct-Viewing						
<i>Black & White</i>						
G	M	M	No	17 x 12-3/4	18000	20CP4
G	M	M	No	17 x 12-3/4	18000	20DP4-A/ 20CP4-A
G	M	M	Yes	17 x 12-3/4	18000	20DP4-C/ 20CP4-D
G	E	M	No	17 x 12-3/4	16000	20HP4-A/ 20MP4
G	E	M	Yes	17 x 12-3/4	16000	20HP4-D
G	M	M	Yes	19-1/8 x 15	20000	21ACP4-A
G	E	M	Yes	19-1/8 x 15	18000	21ALP4-A
G	E	M	Yes	19-1/8 x 15	20000	21ALP4-B
G	M	M	Yes	19-1/8 x 15	18000	21AMP4-A
M	M	M	No	18-1/8 x 13-11/16	18000	21AP4
G	E	M	Yes	19-1/8 x 15	18000	21ATP4
G	E	M	No	19-1/8 x 15	18000	21AVP4/ 21AUP4
G	E	M	Yes	19-1/8 x 15	18000	21AVP4-A/ 21AUP4-A
G	M	M	Yes	19-1/8 x 15	18000	21AWP4
G	M	M	No	19-1/8 x 13-7/8	18000	21EP4-A
G	M	M	Yes	19-1/8 x 13-7/8	18000	21EP4-B
G	E	M	No	19-1/8 x 13-7/8	18000	21FP4-A
G	E	M	Yes	19-1/8 x 13-7/8	18000	21FP4-C
M	E	M	No	18-1/8 x 13-11/16	16000	21MP4
G	E	M	No	19-1/8 x 14-3/16	18000	21YP4
G	E	M	Yes	19-1/8 x 14-3/16	18000	21YP4-A
G	M	M	No	19-1/8 x 14-3/16	18000	21ZP4-A
G	M	M	Yes	19-1/8 x 14-3/16	18000	21ZP4-B
G	M	M	Yes	21-1/4 x 16-3/4	20000	24CP4-A
G	E	M	Yes	21-1/4 x 16-3/4	20000	24DP4-A
G	E	M	Yes	21-1/4 x 16-3/4	20000	24YP4
M	M	M	Yes	23-7/16 x 18-1/8	18000	27MP4

Color

G	E	M	Yes	11-1/2 x 8-5/8	20000	15GP22
M	E	M	Yes	19-1/16 x 15-1/4	25000	21AXP22

Monitor

G	M	M	No	6 Dia.	10000	7QP4
G	E	M	Yes	6 Dia.	12000	7TP4
G	E	M	Yes	9-1/8 Dia.	14000	10SP4

G = Glass rectangular.

⊙ = Glass round.

E = Electrostatic.

M = Metal rectangular.

* = Design-center values.

M = Magnetic.



CLASSIFICATION CHART FOR TYPES IN CATHODE-RAY TUBE SECTION

When choosing tube types, the equipment designer should refer to the RCA PREFERRED TYPES LIST and its companion list - TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN - both of which appear in the General Section.

KINESCOPES (Cont'd)

Envelope	Focusing Method	Deflection Method	Aluminized Screen	Minimum Screen Size Inches	Max. Ultor Volts	TUBE TYPE
Projection						
Ⓒ	E	M	Yes	4-1/4 Dia. ■	40000†	5AZP4
Ⓒ	E	M	Yes	4-1/4 Dia. ●	27000	5TP4
Ⓒ	E	M	Yes	5 x 3-3/4▲	80000†	7NP4
Ⓒ	E	M	Yes	5 x 3-3/4*	80000†	7WP4
View-Finder						
Ⓒ	E	M	Yes	4-1/4 Dia.	10000	5AYP4
Ⓒ	M	M	No	4-1/4 Dia.	8000	5FP4-A
Transcriber						
Ⓒ	E	M	Yes	4-1/4 Dia.	27000	5WP11
CAMERA TUBES						
Major Use	Focusing Method	Deflection Method	Image Size Inches	TUBE TYPE		
Iconoscopes						
Film Pickup	E	M	4-3/4 x 3-9/16	1850-A		
Industrial & Laboratory	E	E	1.4 Diagonal	5527		
Image Orthicons						
Outdoor & Studio Pickup	M	M	1.6 Diagonal	5820		
Color Pickup	M	M	1.6 Diagonal	6474/ 1854		
Vidicons						
Industrial	M	M	0.62 Diagonal	6198		
Film Pickup	M	M	0.62 Diagonal	6326		

■ Quality circle diameter of faceplate. When used with suitable reflective optical system, the 5AZP4 provides an 8' x 6' picture.

● Quality circle diameter of faceplate. When used with suitable reflective optical system, the 5TP4 provides a 24" x 18" picture.

▲ Quality rectangle of faceplate. When used with suitable reflective optical system, the 7NP4 provides a 20' x 15' picture at a projection-throw distance of 60'.

* Like footnote ▲ except projection-throw distance is 80'.

† Design-center values except as noted. † Absolute value.

Ⓒ = Round glass. E = Electrostatic. M = Magnetic.



CLASSIFICATION CHART FOR TYPES IN CATHODE-RAY TUBE SECTION

OSCILLOGRAPH TUBES								
Approx. Bulb Dia. Inches	Max. Ultor Volts [Ⓢ]	TUBE TYPES Classified by Phosphor [Ⓢ]						
		P1	P4	P5	P7	P11	P12	P14
Electrostatic Focus and Deflection								
2	600	902-A	-	-	-	-	-	-
2	1000	2AP1-A	-	-	-	-	-	-
2	2500	2BP1	-	-	-	2BP11	-	-
3	1500	3AP1-A	-	908-A	-	-	-	-
3	2000	3BP1-A	-	-	-	-	-	-
3	2500	3KP1	3KP4	-	-	3KP11	-	-
3	2500	3MP1	-	-	-	-	-	-
3	2500	{ 3RP1 3RP1-A [▲]	3RP4	-	-	-	-	-
5	2000	5BP1-A	-	-	-	-	-	-
5	2500	5UP1	-	-	5UP7	5UP11	-	-
5	15000	912	-	-	-	-	-	-
7	4000	7VP1	-	-	-	-	-	-
9	7000	914-A	-	-	-	-	-	-
Post-Deflection Accelerator Types								
3	4000 [●]	3JP1	-	-	3JP7	-	-	-
5	6000 [●]	5ABP1	5ABP4	-	5ABP7	5ABP11	-	-
5	4000 [●]	5CP1-A	-	-	5CP7-A	5CP11-A	5CP12	-
Magnetic Focus and Deflection								
5	8000	-	-	-	5FP7-A	-	-	5FP14
7	8000	-	-	-	7BP7-A	-	-	-
7	8000	-	-	-	7MP7	-	-	7MP14
10	10000	-	-	-	10KP7	-	-	-
12	10000	-	-	-	{ 12DP7-A 12DP7-B [■]	-	-	-
16	14000	-	-	-	16ADP7	-	-	-
Electrostatic Focus, Magnetic Deflection								
7	8000	7CP1	-	-	-	-	-	-
[Ⓢ] Design-center values. [◆] See sheet FEATURES OF FLUORESCENT SCREENS. [▲] Similar to 3RP1 except for flat faceplate. [●] Maximum post-ultor volts. [■] Similar to 12DP7-A except for Filterglass faceplate.								



CLASSIFICATION CHART FOR TYPES IN CATHODE-RAY TUBE SECTION

When choosing tube types, the equipment designer should refer to the RCA PREFERRED TYPES LIST and its companion list - TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN - both of which appear in the General Section.

MISCELLANEOUS

Approx. Bulb Dia. Inches	Phosphor	Maximum Ultor Volts [Ⓢ]	Focus- ing Method	Deflec- tion Method	TUBE TYPE
Computer Storage Tube					
3	Storage Surface	2500	E	E	6571
Flying-Spot Cathode-Ray Tubes					
Black & White					
5	P15	27000	E	M	5WP15
5	P16	27000	E	M	5ZP16
Color					
5	P24	27000	E	M	5AUP24
Monoscope					
5	Resolution Chart	1500	E	M	2F21
♦ See sheet FEATURES OF FLUORESCENT SCREENS.					
Ⓢ Design-center values.					
E = Electrostatic.					
M = Magnetic.					



FEATURES OF FLUORESCENT SCREENS

Fluorescent screens of the cathode-ray tubes covered in this Section are identified according to phosphor number, e.g., P1, P4, P5, etc.

Phosphor P1 produces a brilliant spot having green fluorescence and medium persistence. Types having this phosphor are particularly useful for general oscillographic applications in which recurrent wave phenomena are to be observed visually.

Phosphor P4 is a highly efficient screen having white fluorescence and medium persistence. Types having this phosphor are of particular interest for television picture tubes.

Phosphor P5 produces a highly actinic spot having bluish fluorescence and very short persistence. Types having this phosphor are especially useful in photographic applications involving film moving at very high speeds.

Phosphor P7 is a long-persistence, cascade (two-layer) screen. During excitation by the electron beam, this phosphor produces a bluish fluorescence of short persistence. After excitation, the screen exhibits a greenish-yellow phosphorescence which persists for several minutes. Types having this phosphor are particularly useful where either extremely low-speed recurrent phenomena or medium-speed non-recurrent phenomena are to be observed.

Phosphor P11 produces a brilliant actinic spot of bluish fluorescence and has sufficiently short persistence to permit its use in all moving film photographic applications without blurring except in those where film moves at a high speed. P11 screens, because of their unusually high brightness characteristic, may also be used for visual observation of phenomena.

Phosphor P12 is a medium-long-persistence phosphor which exhibits both orange fluorescence and phosphorescence. Types utilizing this phosphor are particularly useful for observing low- and medium-speed recurring phenomena.

Phosphor P14 is a medium-long-persistence cascade (two-layer) screen. During excitation by the electron beam, this phosphor exhibits purple fluorescence of short persistence. After excitation, it exhibits an orange phosphorescence which persists for a little over a minute. Types utilizing this phosphor are particularly useful for observing either low- and medium-speed non-recurring phenomena or high-speed recurring phenomena.

Phosphor P15 produces a spot of very short persistence and having both blue-green and near-ultraviolet fluorescence. The persistence of the latter is even shorter than that of the blue-green fluorescence, a feature which makes this phosphor particularly suitable for the high-speed scanning requirements of a flying-spot signal generator.



FEATURES OF FLUORESCENT SCREENS

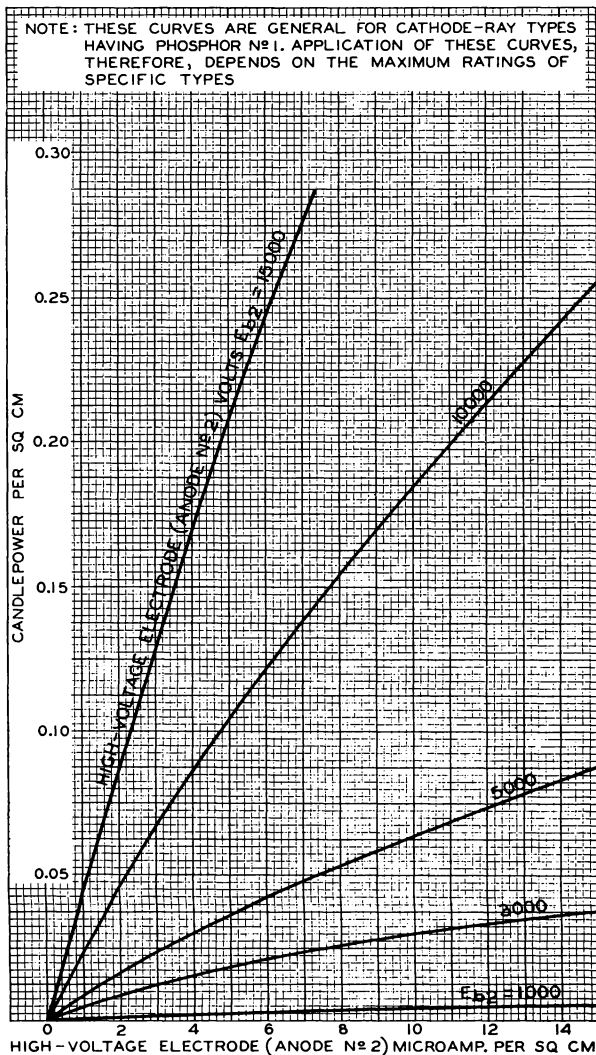
Phosphor P16 produces a spot of extremely short persistence and has both violet and near-ultra violet fluorescence and phosphorescence. This phosphor is particularly useful for the high-speed scanning requirements of a flying-spot signal generator because it features a stable exponential decay characteristic.

Phosphor P22 is the designation for three separate phosphors used in combination in a color picture tube. The separate phosphors are blue, green, and red, respectively. The persistence of the group phosphorescence is classified as medium.

Phosphor P24 has a spectral-energy emission characteristic with peak in the blue-green region and with sufficient range to provide useable energy over the visible spectrum required for generating color signals from color transparencies. The persistence of the phosphor is extremely short.



AVERAGE CHARACTERISTICS OF PHOSPHOR № 1



NOV. 23, 1938

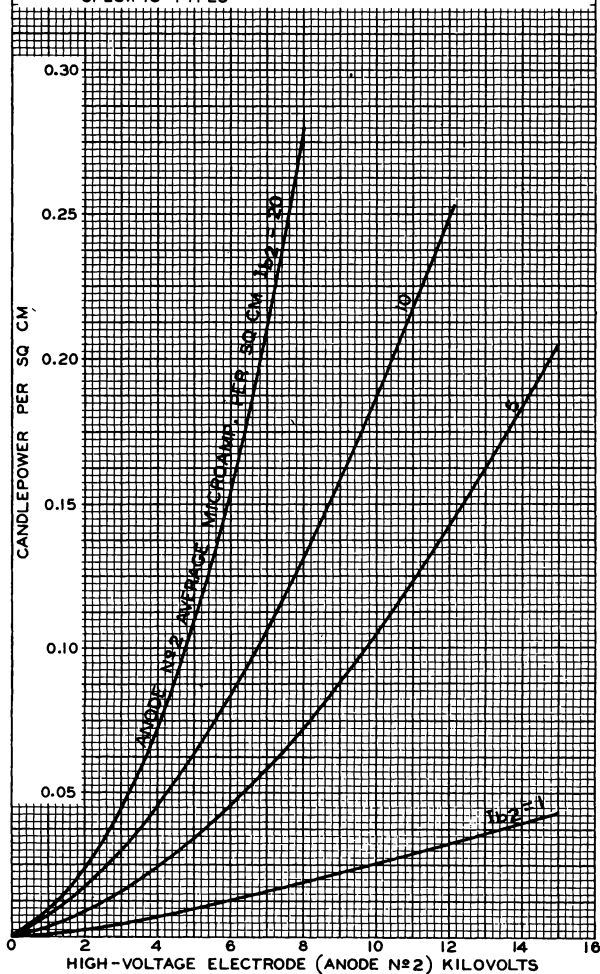
RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6010



AVERAGE CHARACTERISTICS OF PHOSPHOR №1

NOTE: THESE CURVES ARE GENERAL FOR CATHODE-RAY TYPES HAVING PHOSPHOR №1. APPLICATION OF THESE CURVES, THEREFORE, DEPENDS ON THE MAXIMUM RATINGS OF SPECIFIC TYPES



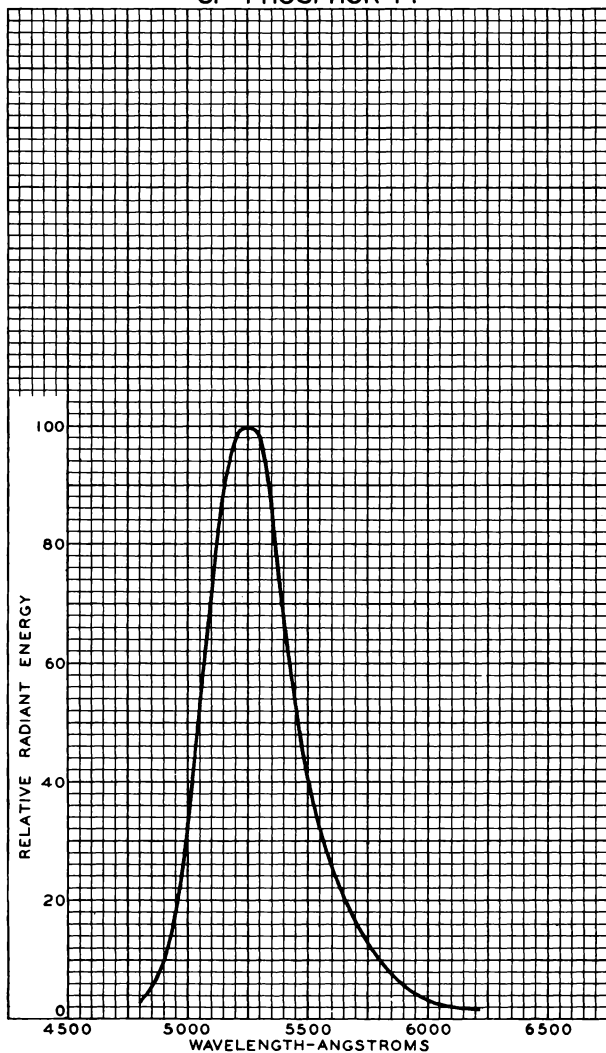
NOV. 23, 1938

RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6009



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P1



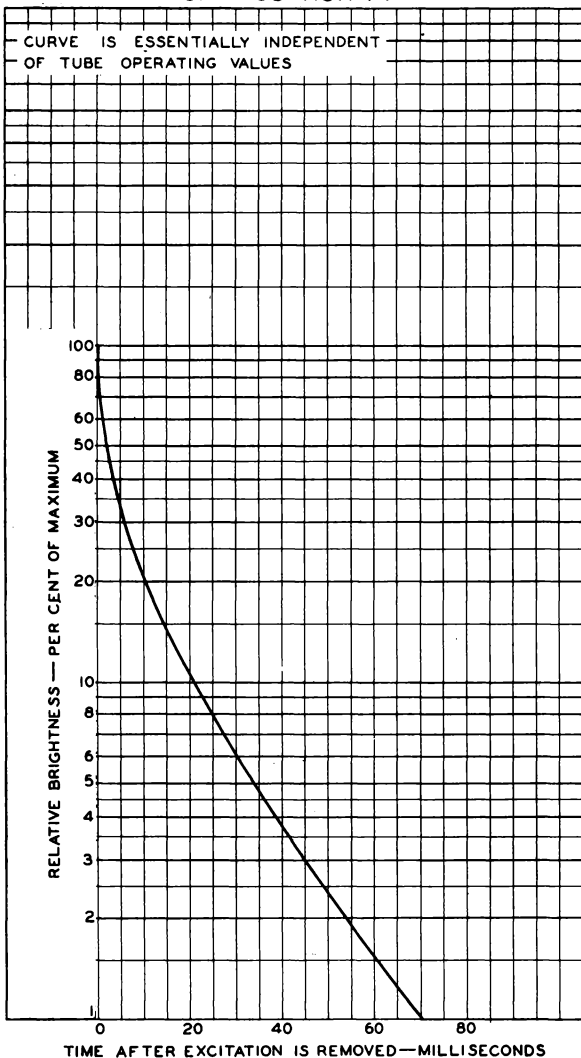
DEC.14,1948

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5372R1



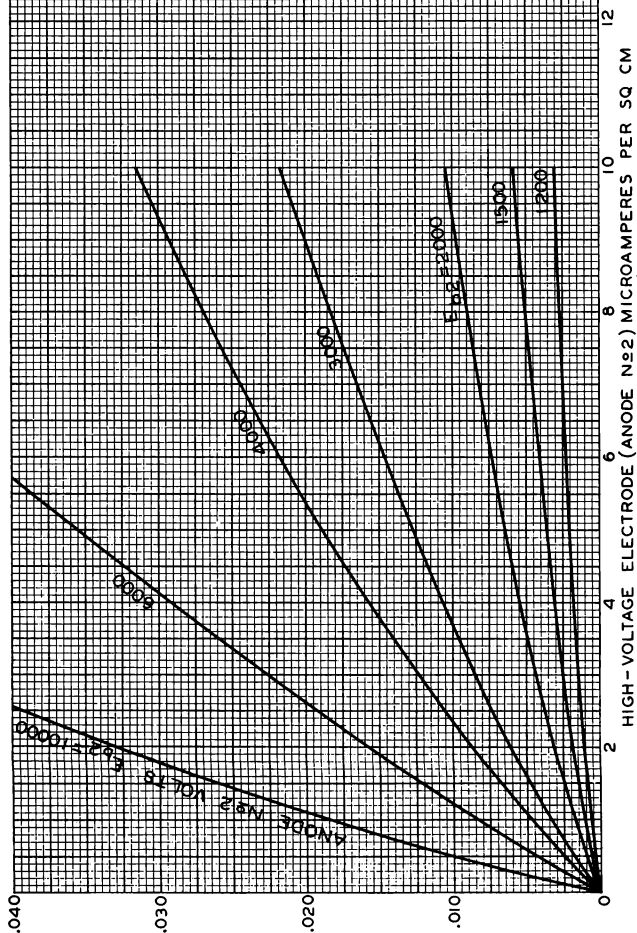
PERSISTENCE CHARACTERISTIC OF PHOSPHOR P1





AVERAGE CHARACTERISTICS OF PHOSPHOR No 4

NOTE : THESE CURVES ARE GENERAL FOR CATHODE-RAY TYPES HAVING PHOSPHOR No 4. APPLICATION OF THESE CURVES, THEREFORE, DEPENDS ON THE MAXIMUM RATINGS OF SPECIFIC TYPES.



OCT. 5, 1938

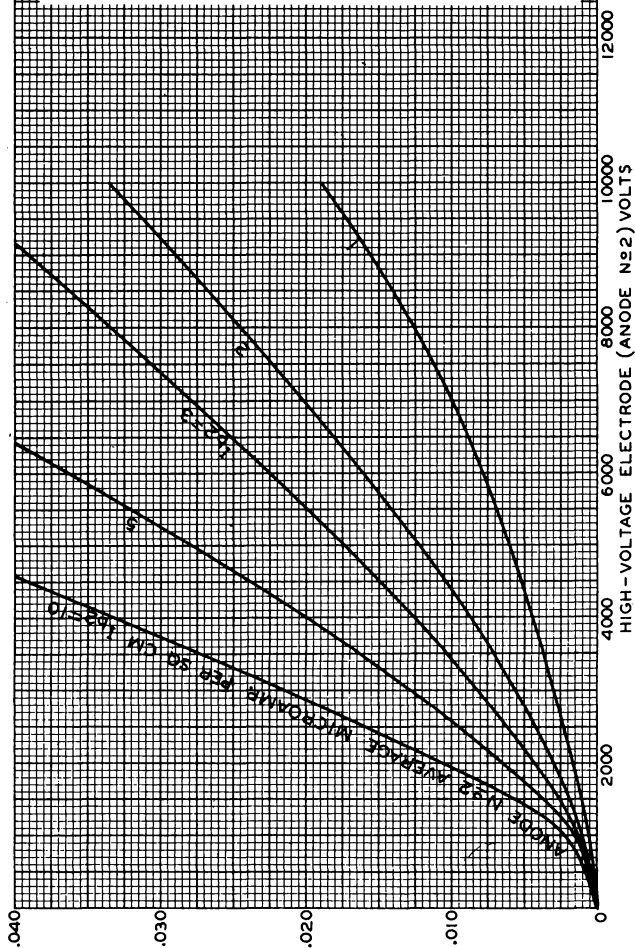
CANDLEPOWER PER SQ CM
RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-4979



AVERAGE CHARACTERISTICS OF PHOSPHOR No 4

NOTE: THESE CURVES ARE GENERAL FOR CATHODE-RAY TYPES HAVING PHOSPHOR No 4. APPLICATION OF THESE CURVES, THEREFORE, DEPENDS ON THE THE MAXIMUM RATINGS OF SPECIFIC TYPES.



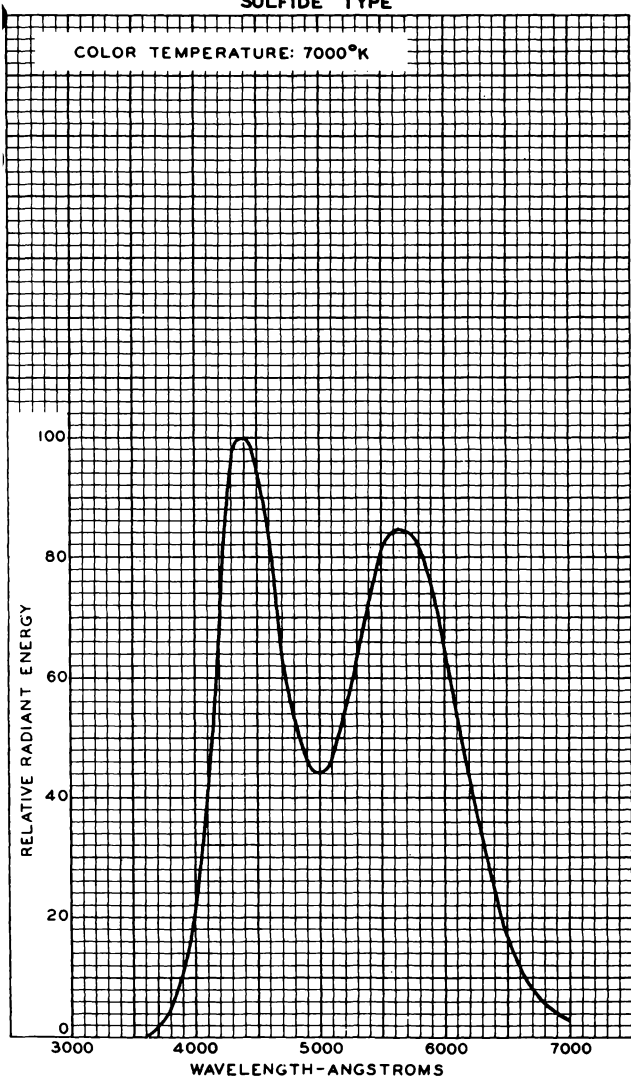
OCT. 5, 1938

CANDLEPOWER PER SQ CM
RCA RADIIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-4978



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR №4 SULFIDE TYPE



JULY 5, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7316

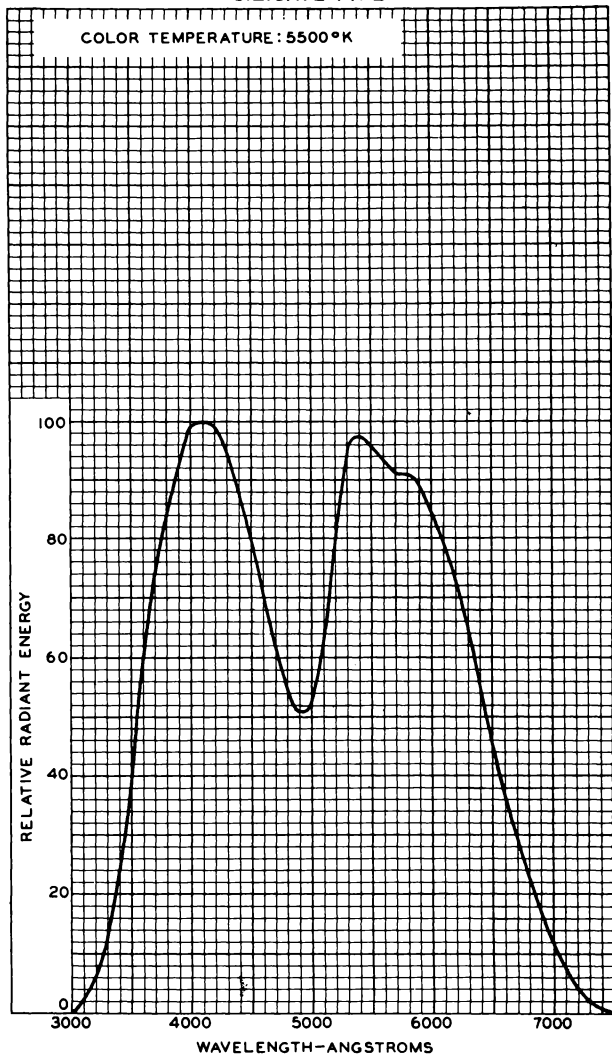


**PERSISTENCE CHARACTERISTIC
OF PHOSPOR N^o 4
SULFIDE TYPE**

The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4 SILICATE TYPE



AUG. 2, 1949

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92 CM-7335

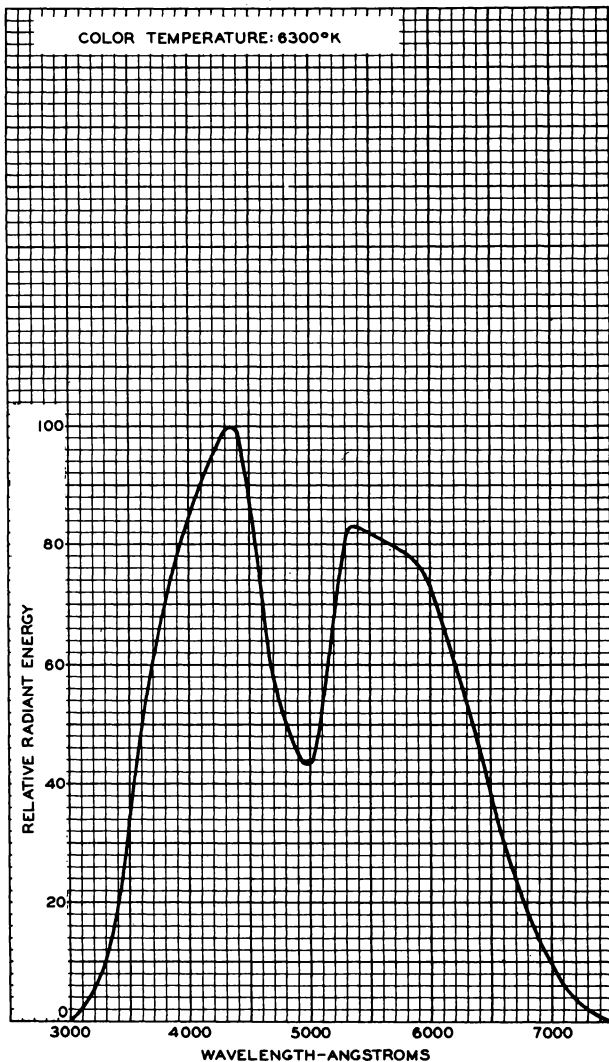


PERSISTENCE CHARACTERISTIC OF PHOSPOR P4 SILICATE TYPE

The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.



SPECTRAL-ENERGY EMISSION CHARACTERISTIC
OF PHOSPHOR No 4
SILICATE-SULFIDE TYPE



MARCH 6, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7458



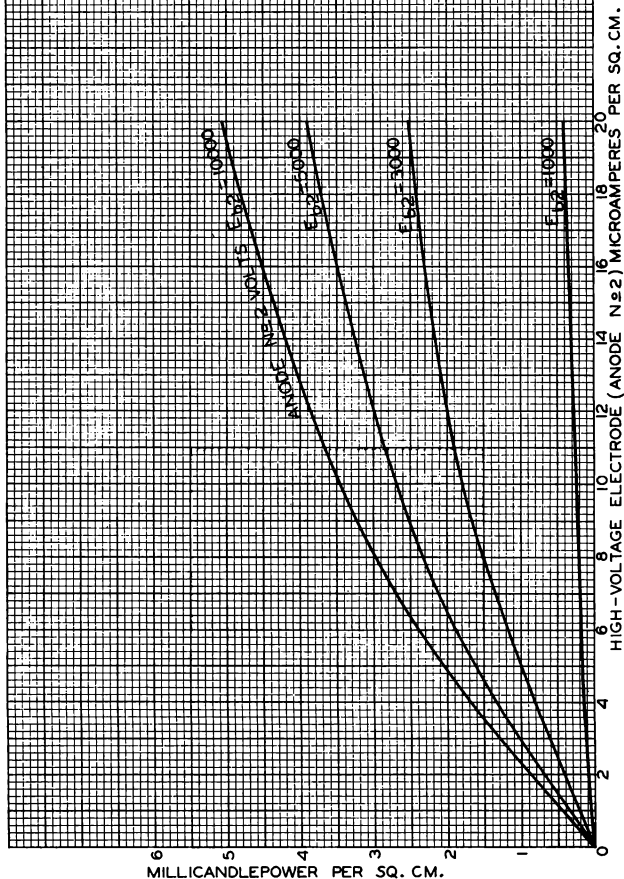
**PERSISTENCE CHARACTERISTIC
OF PHOSPOR N^o 4
SILICATE-SULFIDE TYPE**

The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.



AVERAGE CHARACTERISTICS OF PHOSPHOR No5

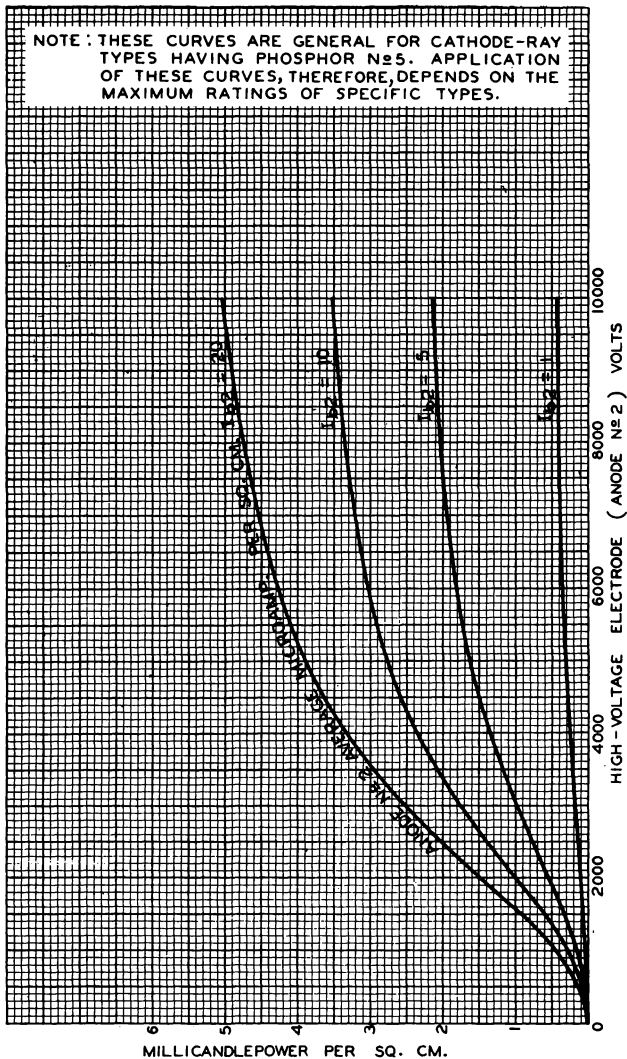
NOTE: THESE CURVES ARE GENERAL FOR CATHODE-RAY TYPES HAVING PHOSPHOR No5. APPLICATION OF THESE CURVES, THEREFORE, DEPENDS ON THE MAXIMUM RATINGS OF SPECIFIC TYPES.





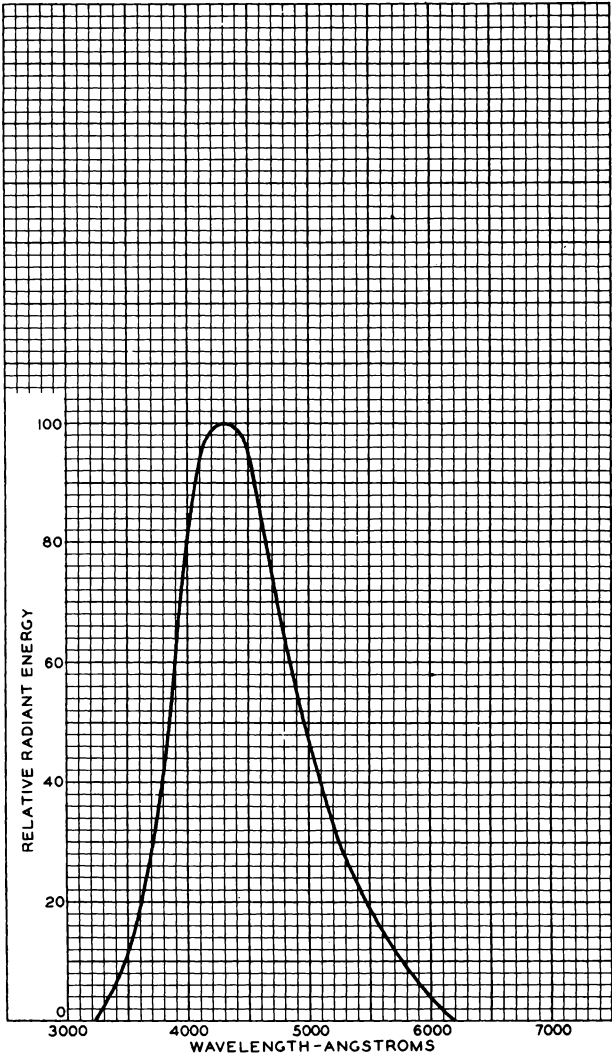
AVERAGE CHARACTERISTICS OF PHOSPHOR No5

NOTE: THESE CURVES ARE GENERAL FOR CATHODE-RAY TUBES HAVING PHOSPHOR No5. APPLICATION OF THESE CURVES, THEREFORE, DEPENDS ON THE MAXIMUM RATINGS OF SPECIFIC TYPES.





SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR N° 5



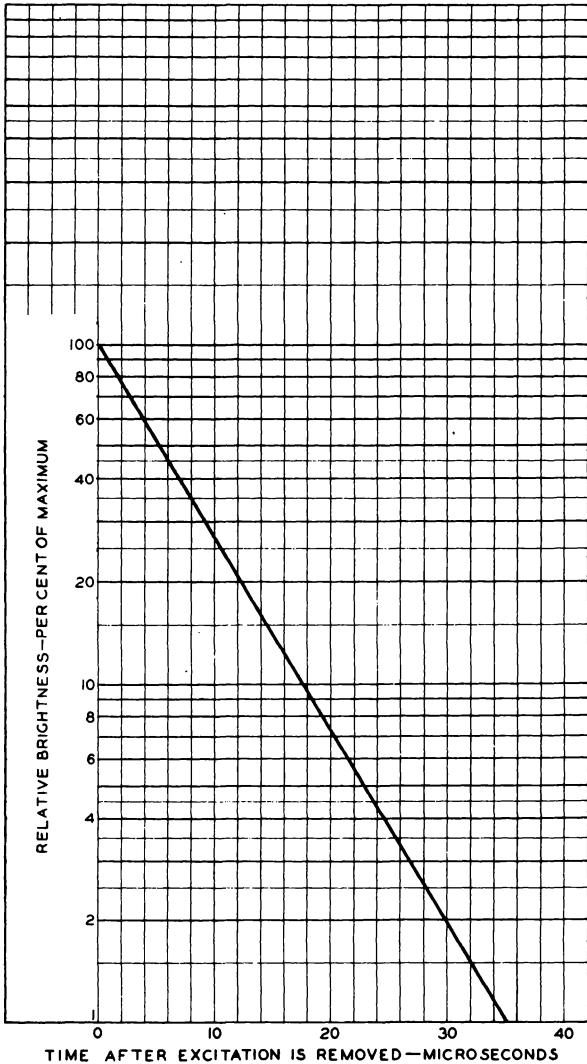
MAY 2, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5559R2



PERSISTENCE CHARACTERISTIC OF PHOSPHOR № 5



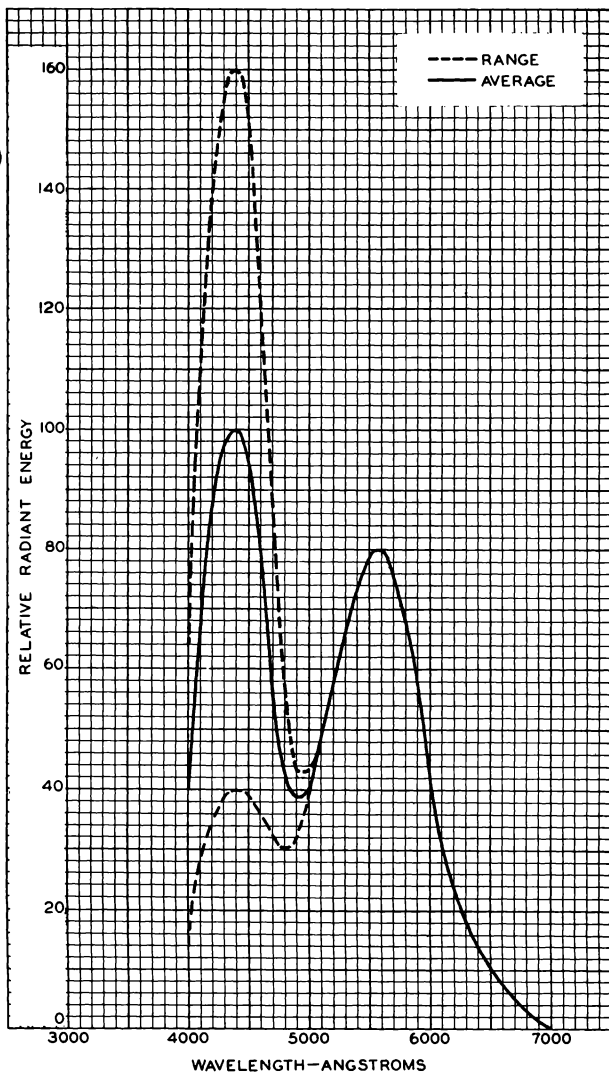
MAY 3, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7266

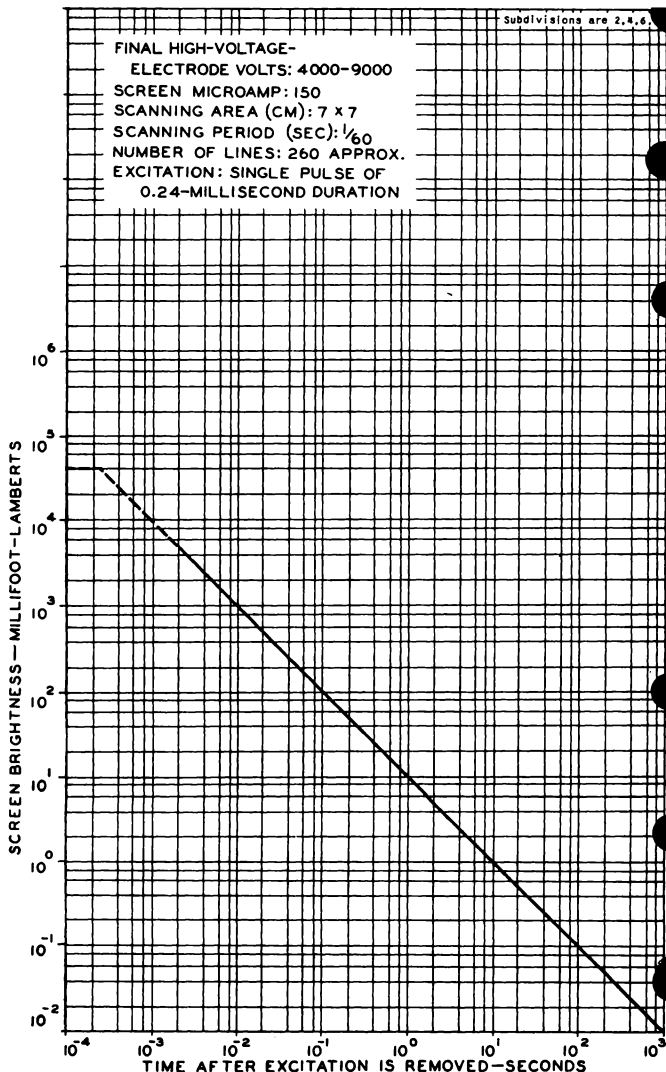


SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P7





PERSISTENCE CHARACTERISTIC OF PHOSPHOR P7



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

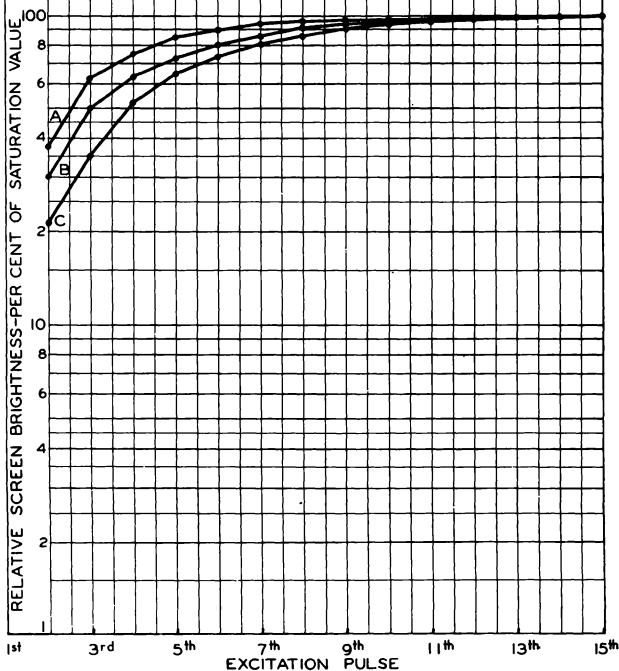
92CM-7015R4



BUILDUP CHARACTERISTICS OF PHOSPHOR P7

FINAL HIGH-VOLTAGE-ELECTRODE VOLTS: 4000-9000
SCANNING AREA (CM): 7 x 7
NUMBER OF LINES: 260 APPROX.
EXCITATION: PULSE OF $\frac{1}{60}$ -SECOND DURATION
SUPPLIED TO GRID N^o1 OF CATHODE-
RAY TUBE AT 1-SECOND INTERVALS
FOR EACH OF THE LOCI UNDER
THE INDICATED CONDITIONS.
BRIGHTNESS: MEASURED JUST BEFORE EACH
EXCITATION PULSE.

LOCUS	SCREEN MICROAMP
A	150
B	75
C	37





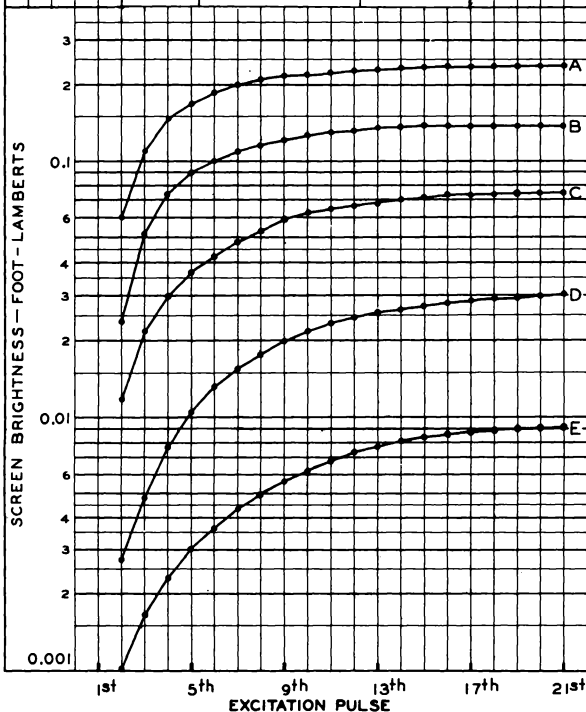
BUILDUP CHARACTERISTICS OF PHOSPHOR P7

SCANNING AREA (CM): 7x7

NUMBER OF LINES: 260 APPROX.

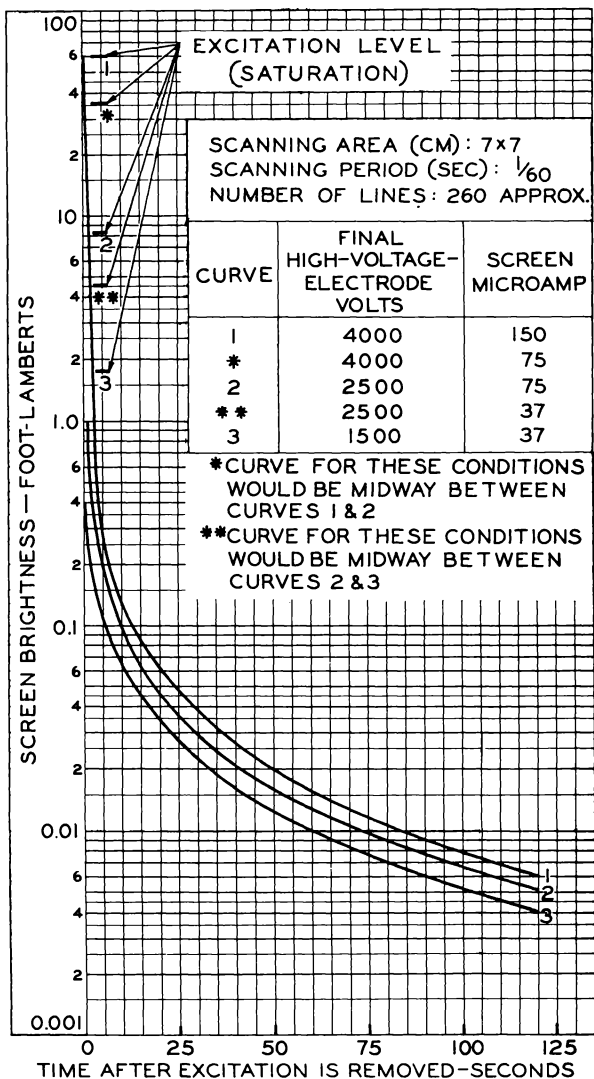
EXCITATION: PULSE OF $\frac{1}{60}$ -SECOND DURATION SUPPLIED
TO GRID N°1 OF CATHODE-RAY TUBE AT
1-SECOND INTERVALS FOR EACH OF THE
LOC UNDER THE INDICATED CONDITIONS.
BRIGHTNESS: MEASURED JUST BEFORE EACH EXCITATION
PULSE.

LOCUS	FINAL HIGH-VOLTAGE- ELECTRODE VOLTS	SCREEN MICROAMP
A	4000	150
B	4000	75
C	2500	75
D	2500	37
E	1500	37





PERSISTENCE CHARACTERISTICS OF PHOSPHOR P7



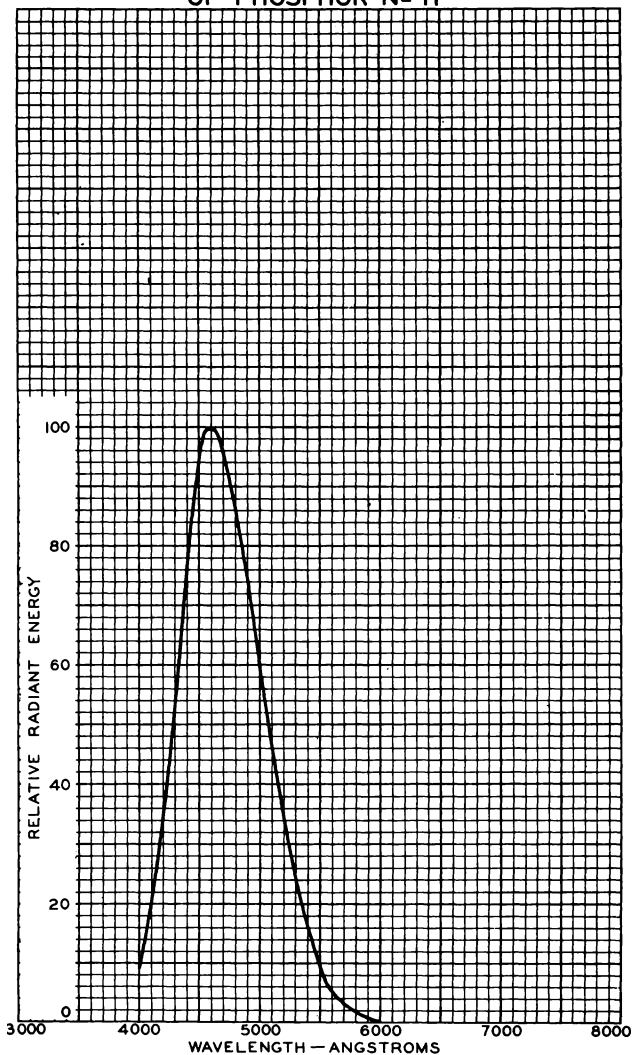
TUBE DIVISION

92CL-6804R5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR № 11



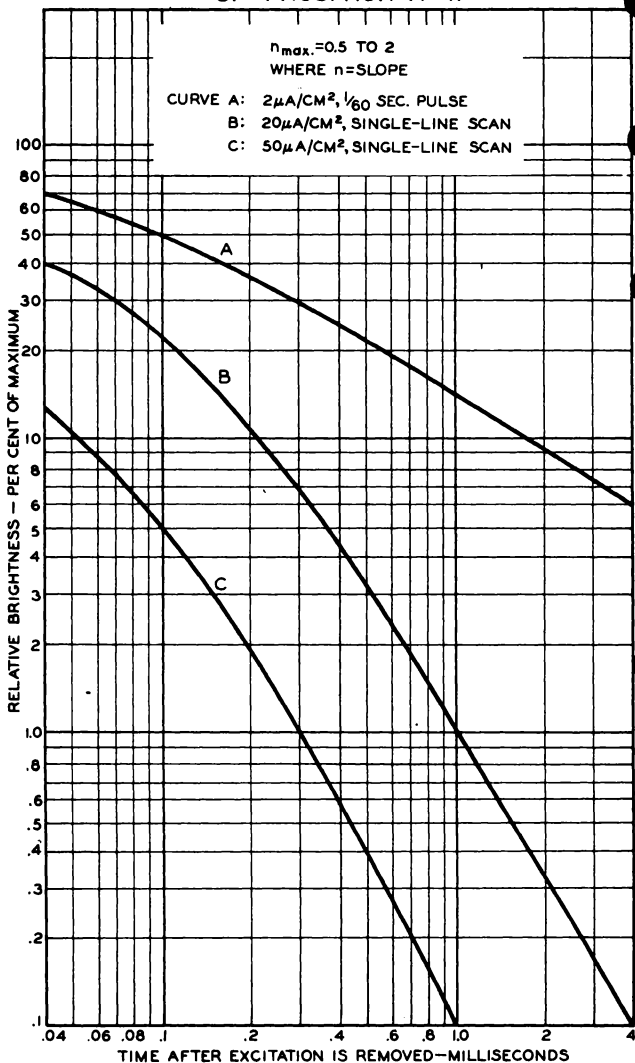
APRIL 9, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6749



PERSISTENCE CHARACTERISTICS OF PHOSPHOR N^o11



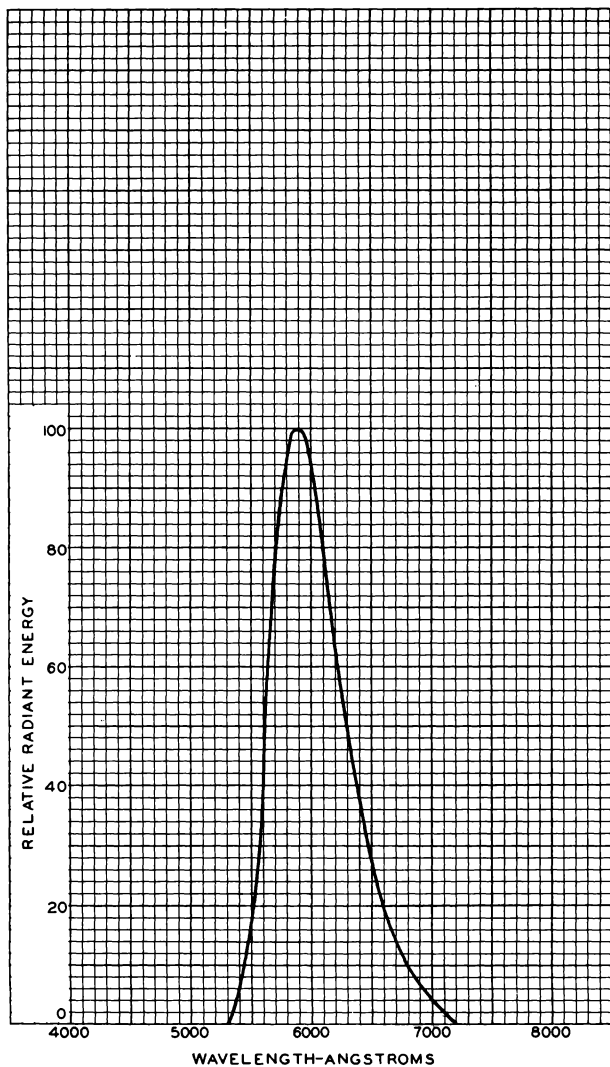
JULY 7, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6806R2



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P12



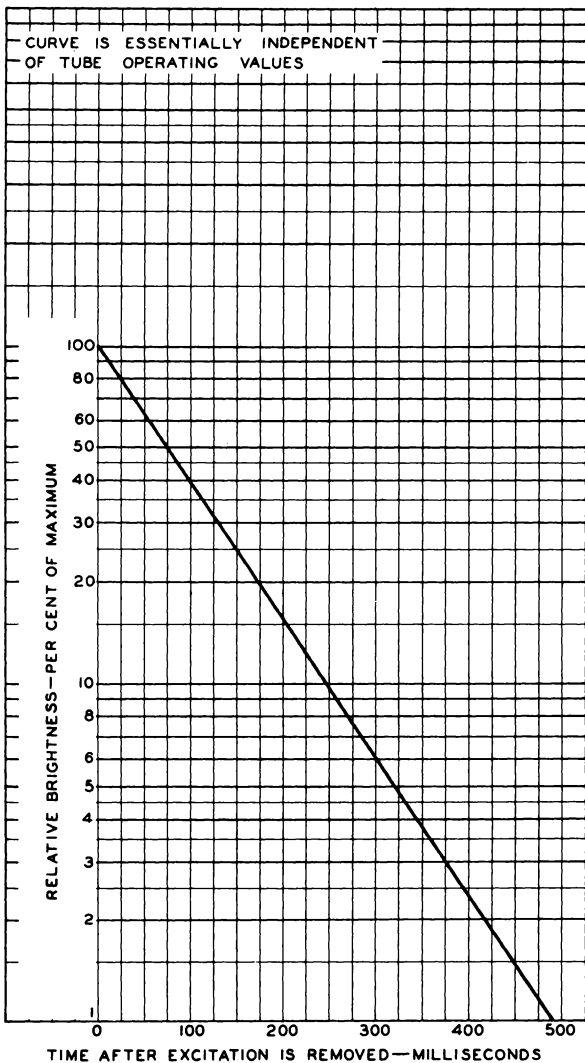
JULY 18, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7317



PERSISTENCE CHARACTERISTIC OF PHOSPHOR P12



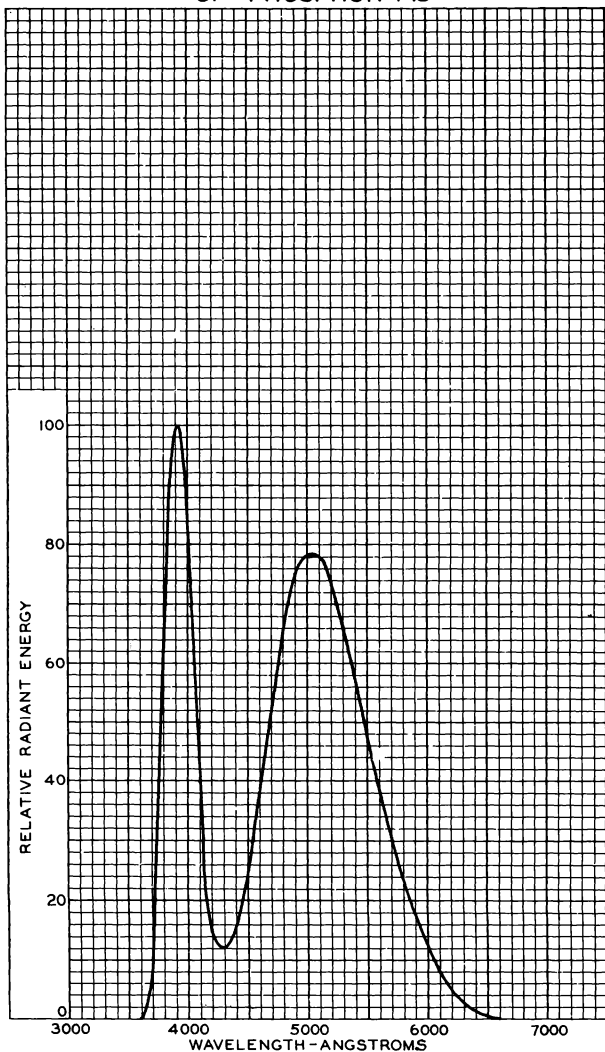
FEB. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 7318R1



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P15

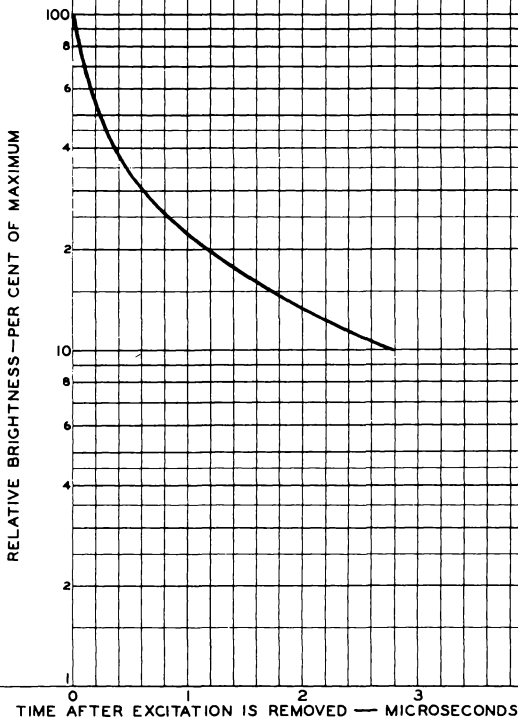




PERSISTENCE CHARACTERISTIC OF PHOSPHOR P15

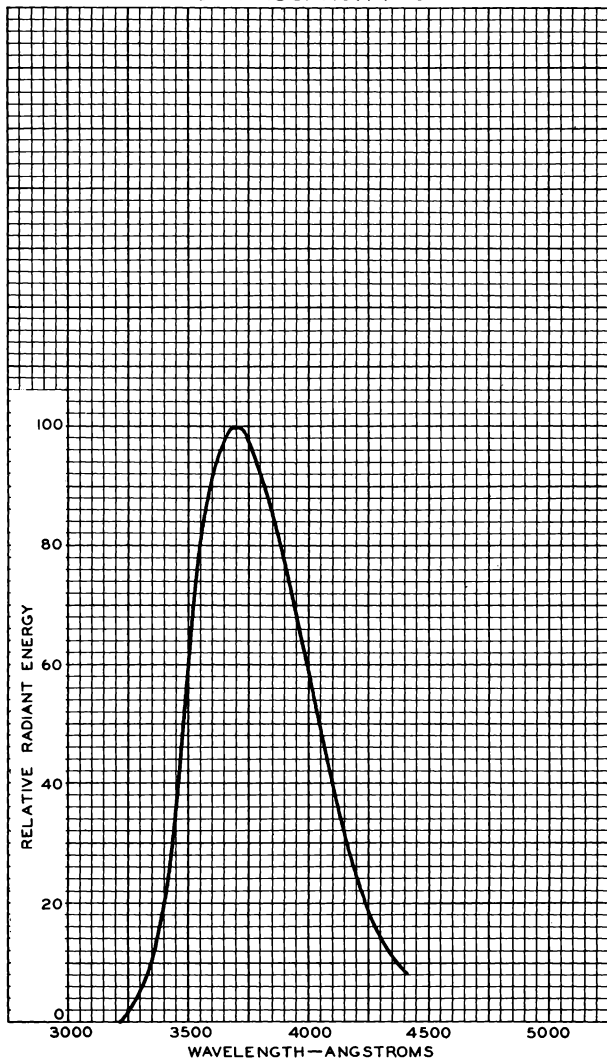
COMPONENTS	EACH ESSENTIALLY INDEPENDENT OF TUBE OPERATING VALUES
VISIBLE	SHOWN BY CURVE
ULTRAVIOLET	DECAYS TO APPROXIMATELY 10% OF MAXIMUM IN NOT MORE THAN 0.05 MICROSECOND.

SPOT: SHARPLY FOCUSED





SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P16



OCT. 30, 1950

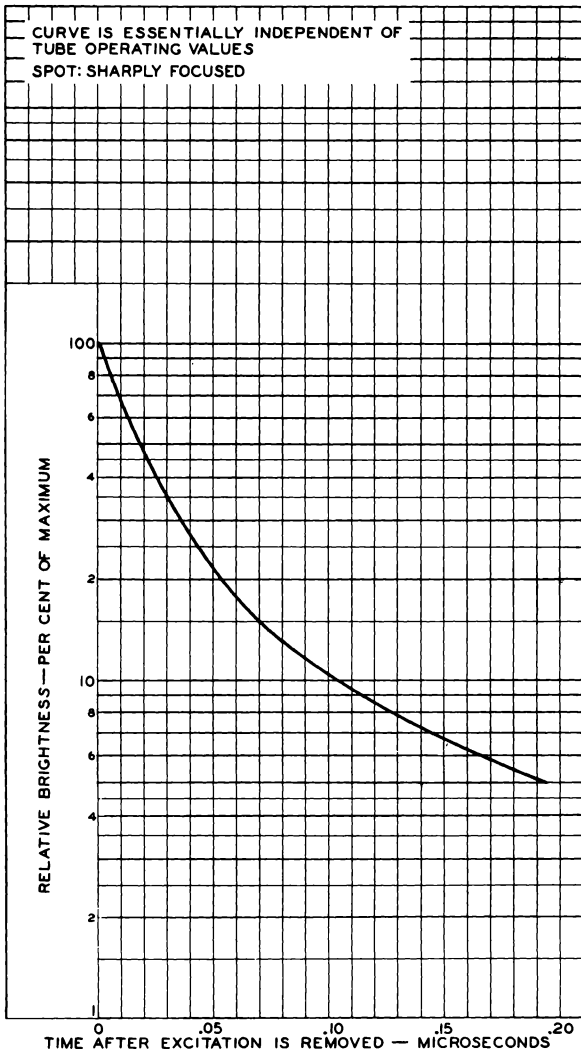
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7563



PERSISTENCE CHARACTERISTIC OF PHOSPHOR P16

CURVE IS ESSENTIALLY INDEPENDENT OF
TUBE OPERATING VALUES
SPOT: SHARPLY FOCUSED



FEB. 23, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

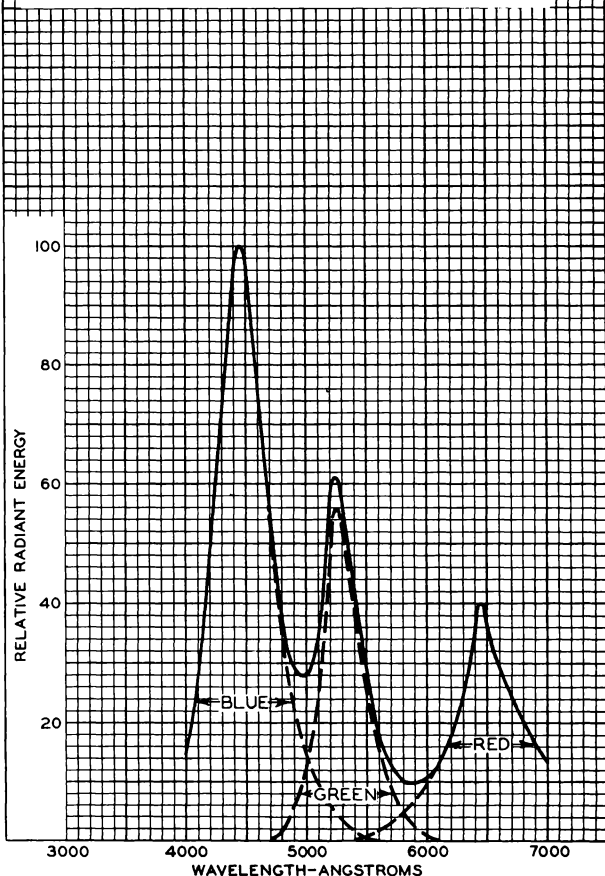
92CM-7564RI



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF GROUP PHOSPHOR P22

EQUAL EXCITATION OF EACH PHOSPHOR

PHOSPHOR	RANGE OF MAX. VALUE ANGSTROMS
BLUE EMITTING	4420 TO 4520
GREEN EMITTING	5230 TO 5270
RED EMITTING	6360 TO 6580



JAN. 14, 1954

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7969R2

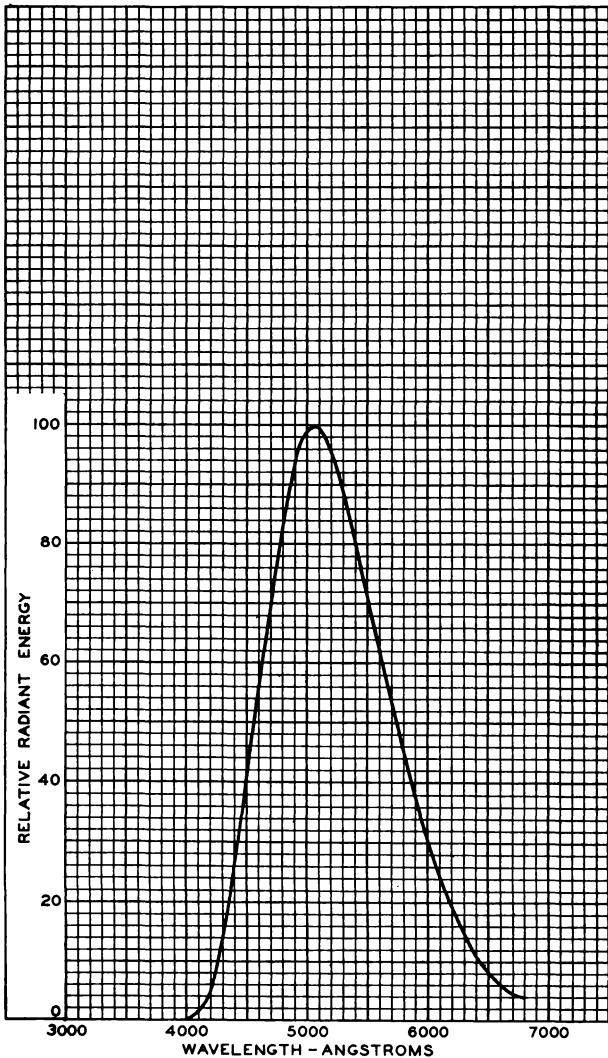


PERSISTENCE CHARACTERISTIC OF GROUP PHOSPHOR P22

The persistence of the group phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P24



DEC. 18, 1953

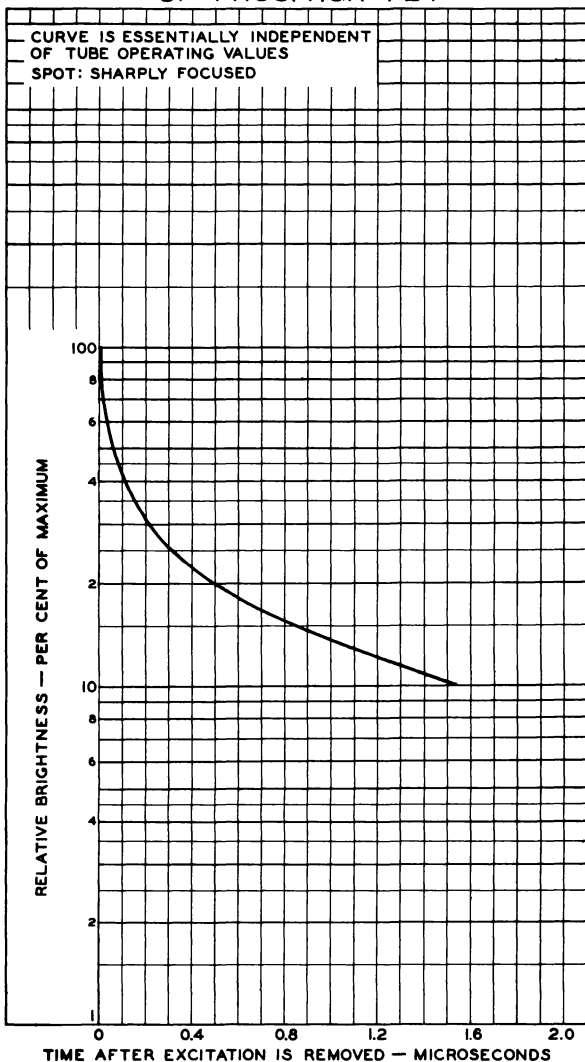
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8204



PERSISTENCE CHARACTERISTIC OF PHOSPHOR P24

CURVE IS ESSENTIALLY INDEPENDENT
OF TUBE OPERATING VALUES
SPOT: SHARPLY FOCUSED



FEB. 18, 1955

TUBE DIVISION

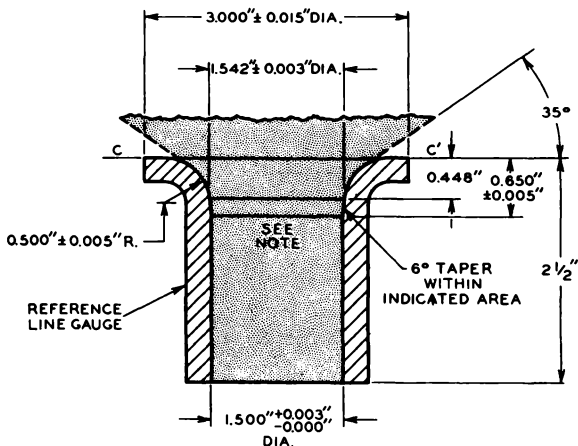
92CM - 8205R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



REFERENCE-LINE GAUGE JETEC N^o 110

*With Supplementary Information on Recommended Inside
Contour of Yoke to Provide Proper Location of
Yoke on Neck-Funnel Section.*

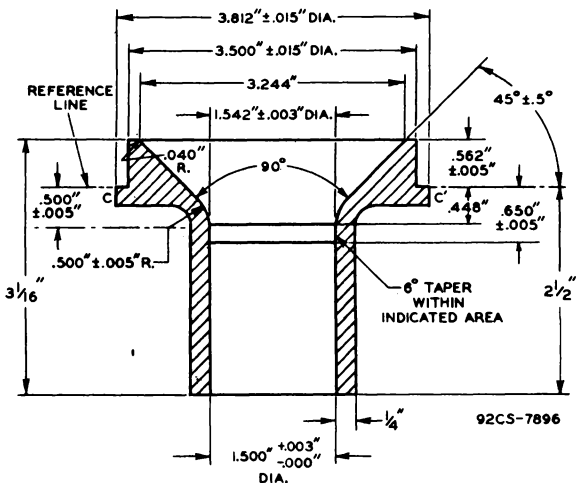


NOTE: INNER SURFACE OF YOKE MUST
NOT EXTEND INTO SHADED REGION

92CS-7391



REFERENCE-LINE GAUGE JETEC N^o 116



AUG. 1, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7896



X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES

WARNING

All types of cathode-ray tubes may be operated at voltages (where ratings permit) up to 16 kilovolts (absolute value) without personal injury on prolonged exposure at close range.

Above 16 kilovolts, special shielding precautions for X-ray radiation may be necessary.



DEFINITIONS OF CATHODE-RAY TUBE TERMS

Ultor. The "ultor" in a cathode-ray tube is the element to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

Post-Ultor. The "post-ultor" in a cathode-ray tube is the element to which is applied a dc voltage higher than the ultor voltage for accelerating the electrons in the beam after its deflection.



2AP1-A

2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 2AP1

General:

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts
 Current. 0.6 amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.0 . . . $\mu\mu\text{f}$
 Cathode to All Other Electrodes. 5.5 . . . $\mu\mu\text{f}$
 DJ₁ to DJ₂ 0.6 . . . $\mu\mu\text{f}$
 DJ₃ to DJ₄ 1.1 . . . $\mu\mu\text{f}$
 DJ₁ to All Other Electrodes. 8.5 . . . $\mu\mu\text{f}$
 DJ₃ to All Other Electrodes. 9.0 . . . $\mu\mu\text{f}$
 DJ₁ to All Other Electrodes except DJ₂ 8.0 . . . $\mu\mu\text{f}$
 DJ₂ to All Other Electrodes except DJ₁ 4.6 . . . $\mu\mu\text{f}$
 DJ₃ to All Other Electrodes except DJ₄ 7.5 . . . $\mu\mu\text{f}$
 DJ₄ to All Other Electrodes except DJ₃ 6.0 . . . $\mu\mu\text{f}$

Phosphor (For Curves, see front of this Section) . . . No.1

Fluorescence Green

Persistence Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

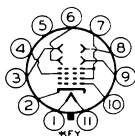
Overall Length $7-7\frac{1}{16}'' \pm \frac{3}{16}''$ Greatest Diameter of Bulb. $2'' \pm \frac{1}{16}''$ Minimum Useful Screen Diameter $1-3\frac{1}{4}''$

Mounting Position. Any

Base Small Shell Magnal 11-Pin

Basing Designation for BOTTOM VIEW 11L

Pin 1-Heater
 Pin 2-Cathode
 Pin 3-Deflecting
 Electrode DJ₁
 Pin 4-Anode No.1
 Pin 5-No Connection
 Pin 6-Deflecting
 Electrode DJ₄
 Pin 7-Anode No.2,
 Grid No.2



Pin 8-Deflecting
 Electrode
 DJ₂
 Pin 9-Deflecting
 Electrode
 DJ₃
 Pin 10-Grid No.1
 Pin 11-Heater

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 4. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 1 does not exceed 10° .

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is $90^\circ \pm 4^\circ$.

2AP1-A



2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Maximum Ratings, Absolute Values:

ANODE-No.2 & GRID-No.2 VOLTAGE	1100 <i>max.</i>	volts
ANODE-No.1 VOLTAGE	550 <i>max.</i>	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value ;	125 <i>max.</i>	volts
Positive Value	0 <i>max.</i>	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	660 <i>max.</i>	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 <i>max.</i>	volts
Heater positive with respect to cathode	10 <i>max.</i>	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage*	500	1000		volts
Anode-No.1 Voltage for Focus at 75% of Grid-No.1 Volt- age for Cutoff*	125	250		volts
Grid-No.1 Volt. for Visual Cutoff#	-30	-60		volts
Max. Anode-No.1 Current Range^	Between -50 and +10 μ amp.			
Deflection Sensitivity:				
DJ1 and DJ2.	0.220	0.110		mm/v dc
DJ3 and DJ4.	0.260	0.130		mm/v dc
Deflection Factor:**				
DJ1 and DJ2.	115	230		v dc/in.
DJ3 and DJ4.	98	196		v dc/in.

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 500 volts.

● Individual tubes may require between +20% and -45% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to $\pm 50\%$ of these values.

^Δ See curve for average values.

** Individual tubes may vary from these values by $\pm 20\%$.

Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ1 and DJ2. Suitable test conditions are: anode-No.2 voltage, 1000 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 <i>max.</i>	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 <i>max.</i>	megohm

JULY 1, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1



2A1-A

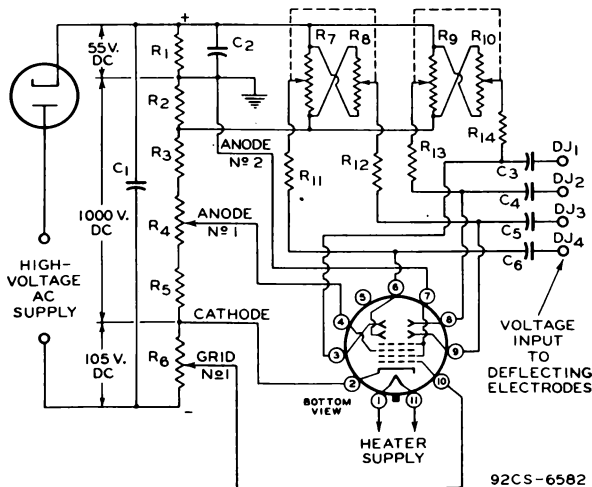
(continued from preceding page)

Resistance in Any Deflecting-

Electrode Circuit▲▲ 5.0 *max.* megohms

▲▲ It is recommended that all deflecting-electrode-circuit resistances be approximately equal.

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μ f
C2: 1.0 μ f
C3 C4 C5 C6: 0.05- μ f Blocking
Capacitor*
R1 R2: 0.5 Megohm
R3: 3.0 Megohms

R4: 1.0-Megohm Potentiometer
R5: 0.5 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms

* When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

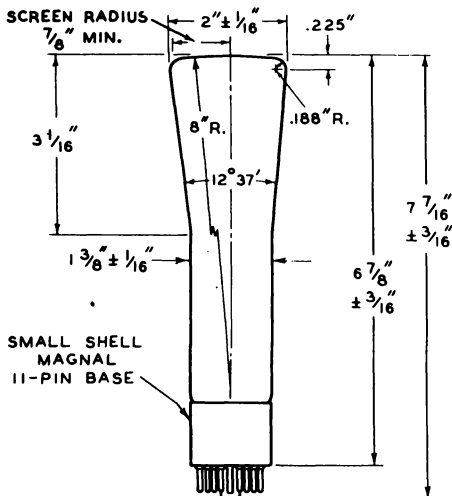
The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

2API-A



2API-A

HIGH-VACUUM CATHODE-RAY TUBE



92CM-6368R2

CL OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM PERPENDICULAR
ERECTED AT CENTER OF BOTTOM OF BASE



2AP1-A

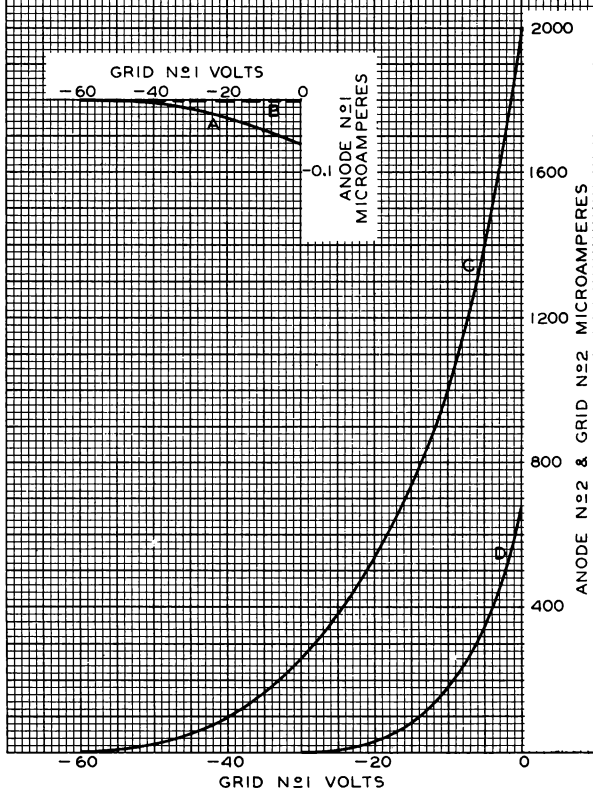
2AP1-A

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

ANODE N°1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE N°2 & GRID N°2 VOLTS
A	ANODE N°1	1000
B	ANODE N°1	500
C	ANODE N°2 & GRID N°2	1000
D	ANODE N°2 & GRID N°2	500



APR. 17, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6410R1



OSCILLOGRAPH TUBE

ELECTROSTATIC DEFLECTION

General:

Voltage.	6.3	ac or dc volts
Current.	0.6	amp

Grid No.1 to All Other Electrodes.	8	. . .	μf
DJ ₁ to DJ ₂	2	. . .	μf
DJ ₃ to DJ ₄	2	. . .	μf
DJ ₁ to All Other Electrodes.	11	. . .	μf
DJ ₂ to All Other Electrodes.	8	. . .	μf
DJ ₂ to All Other Electrodes.	7	. . .	μf
DJ ₁ to All Other Electrodes.	8	. . .	μf

Fluorescence	Green
Persistence.	Medium

Basing Designation for BOTTOM VIEW 12E

Pin 12 – Heater

DJ_1 and DJ_2 are nearer the screen
 DJ_3 and DJ_4 are nearer the base

The angle between DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is $90^\circ \pm 30^\circ$.

← Indicates a change.

2BP1



2BP1

OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ANODE-No.2* VOLTAGE.	2500 max.	volts
ANODE-No.1 VOLTAGE	1000 max.	volts
→ GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE. .	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between 500* and 2500 volts

Anode-No.1 Voltage . . .	15% to 28% of E_{b2}	volts
→ Max. Grid-No.1 Voltage for Visual Cutoff. .	6.75% of E_{b2}	volts
Max. Anode-No.1 Current Range. .	-15 to +10 . .	microamperes
Deflection Factors:		
DJ ₁ & DJ ₂	115 to 155 v dc/in./kv of E_{b2}	
DJ ₃ & DJ ₄	74 to 100 v dc/in./kv of E_{b2}	
→ Spot Position.	□	

Examples of Use of Design Ranges:

For anode-No.2 voltage of	1000	2000	volts
Anode-No.1 Voltage . .	150 - 280	300 - 560	volts
Max. Grid-No.1 Voltage for Visual Cutoff.	-67.5	-135	volts
Deflection Factors:			
DJ ₁ & DJ ₂	115 - 155	230 - 310	volts dc/in.
DJ ₃ & DJ ₄	74 - 100	148 - 200	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting- Electrode Circuit ^o . . .	5.0 max.	megohms

* Brilliance and definition decrease with decreasing anode-No.2 voltage. A value as low as 500 volts is recommended only for low-velocity deflection and low room-light levels.

o It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

• Anode No. 2 and grid No. 2 which are connected together within tube, are referred to herein as anode No. 2. The product of anode-No. 2 voltage and average anode-No. 2 current should be limited to 6 watts.

□ The center of the undeflected, focused spot will fall within a circle having a 5.0-mm radius concentric with the center of the tube face.

→ Indicates a change.



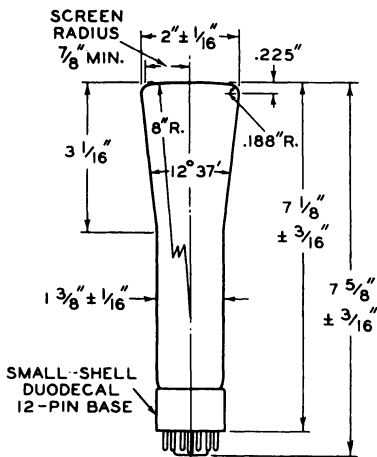
2BPI

2BP1



2BP1

OSCILLOGRAPH TUBE



Q OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

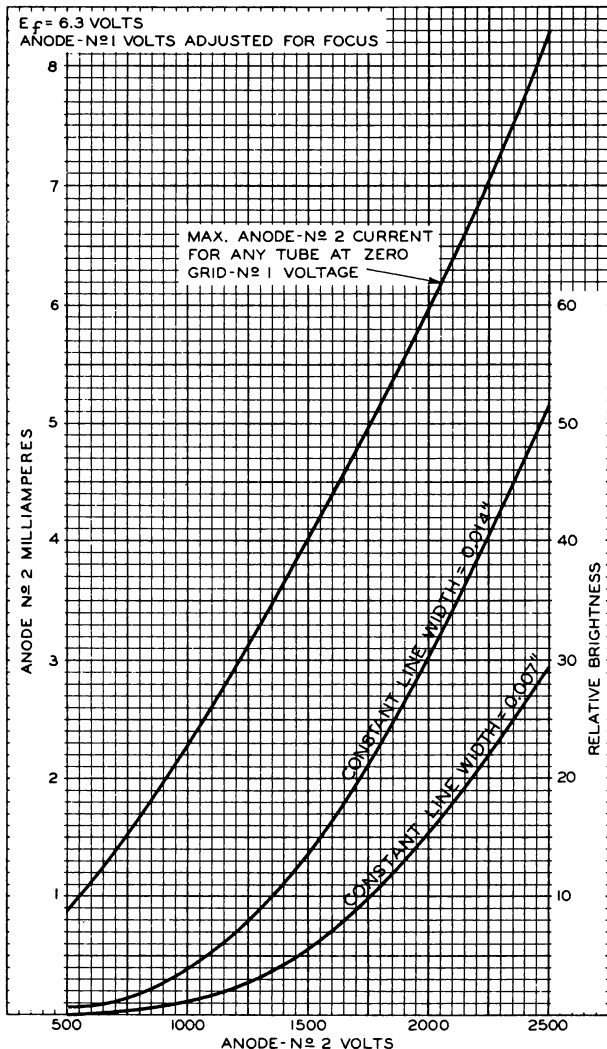
92CS-6689



2BP1

CHARACTERISTICS

2BP1



AUGUST 14, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

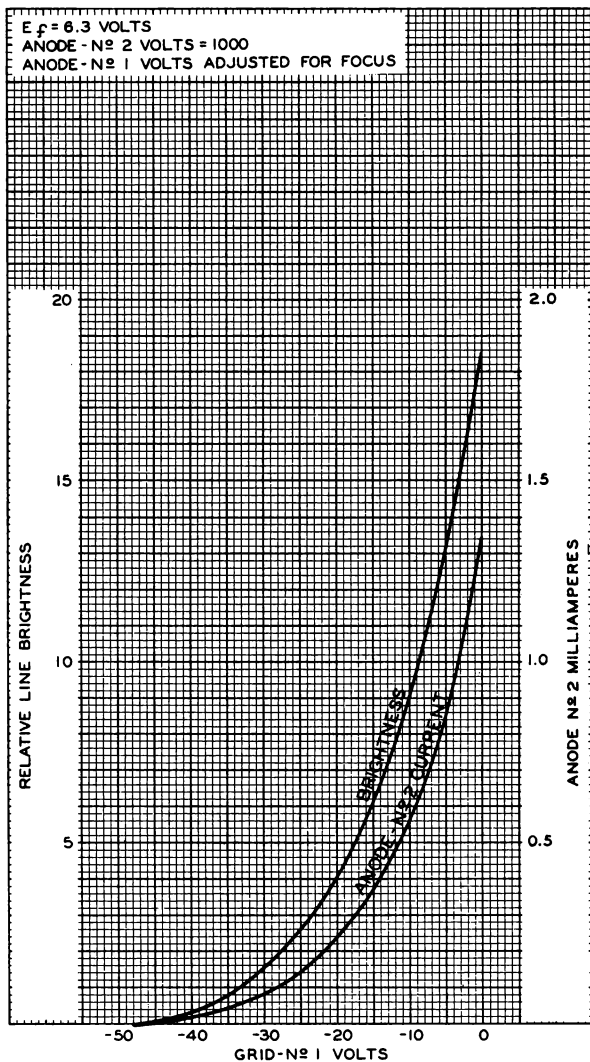
92CM-6748R1

2BP1



2BP1

AVERAGE CHARACTERISTICS



AUGUST 14, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6747R1



2BP11

2BP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 2BP11 is the same as the 2BP1 except that it has a phosphor of the short-persistence, blue-fluorescence type designated P11. The blue radiation of the P11 screen is highly actinic and has sufficiently short persistence to permit use of the 2BP11 in all moving film photographic applications without blurring except in those where film moves at a high speed. The 2BP11 is also quite satisfactory for visual observation of phenomena because its phosphor has unusually high brightness for a blue screen.

In general, operation of the 2BP11 at an anode-No.2 voltage less than 1000 volts is not recommended.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC
and the PERSISTENCE CHARACTERISTIC of
the P11 Phosphor are shown at the
front of this Section



2F21 MONOSCOPE

5-INCH MAGNETIC-DEFLECTION TYPE

Supersedes Type 1899

2F21

General:

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 7 μf

Pattern Electrode to Grid No.4 5 μf

Pattern:

Type See illustration on next page

Dimensions (Approx.) $2-5/16" \times 3-1/16"$

Calibration. Up to 500 lines

Focusing Method. Electrostatic

Deflection Method Magnetic

Maximum Solid Deflection Angle 40°

Overall Length $12-7/16" + 1/4" - 7/16"$

Greatest Diameter of Bulb. $5-1/16"$ max.

Caps (Two) Recessed Small Ball

Mounting Position. Any

Base Long-Shell Medium 6-Pin

Basing Designation for BOTTOM VIEW 6BV

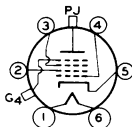
Pin 1-Heater

Pin 2-Grid No.2

Pin 3-Grid No.3

Pin 4-Grid No.1

Pin 5-Cathode



Pin 6 -Heater

End Cap -Pattern

Electrode

Side Cap-Grid No.4

Maximum Ratings, Design-Center Values:

PATTERN-ELECTRODE VOLTAGE. 1500 max. volts

GRID-No.4 (COLLECTOR) VOLTAGE. 1500 max. volts

GRID-No.3 (FOCUSING ELECTRODE) VOLTAGE 600 max. volts

GRID-No.2 (ACCELERATING ELECTRODE) VOLT. 1600 max. volts

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative Bias Value. 125 max. volts

Positive Bias Value. 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode 125 max. volts

Heater positive with respect to cathode 125 max. volts

Typical Operation: †

Pattern-Electrode Voltage. 1000 . . . volts

Grid-No.4 Voltage. 1050 . . . volts

Grid-No.3 Voltage for Focus at

$0.5 \mu\text{amp}$ Grid-No.4 Current[‡] 300 approx. volts

Grid-No.2 Voltage. 1000 . . . volts

Grid-No.1 Voltage for

Visual Cutoff on Monitor[#] -50 approx. volts

Internal Resistance between

Grid No.4 and Pattern Electrode Greater than 1 meg.

Grid-No.4 Current. $0.5 \mu\text{amp}$

†, ‡, #: See next page.

JUNE 20, 1946

TUBE DIVISION

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2F21



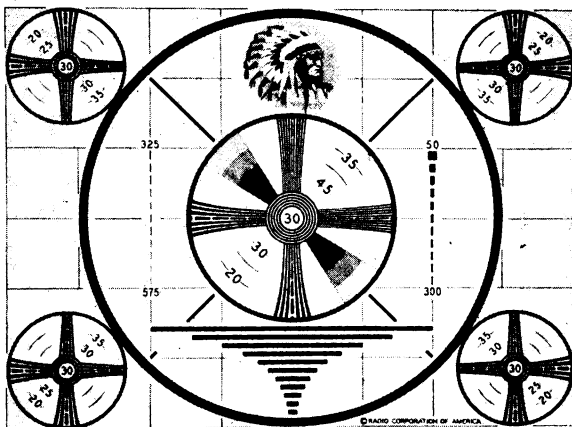
2F21

MONOSCOPE

Pattern-Electrode Signal Current	
(Peak-to-Peak)	0.5 approx. μ amp
Resolution Capability ^{▲▲}	500 . . . lines
Maximum Circuit Value:	
Grid-No.1-Circuit Resistance	1.5 max. megohms

- ▲ Individual tubes may require between + 20% and - 20% of these values.
 † Deflection must be maintained at all times. When scanned area does not cover entire pattern, the beam current should be reduced accordingly and time of operation limited to prevent damaging the pattern.
 * Supply should be adjustable between + 40% and - 80% of this value.
 ▲▲ with full scanning.

PATTERN



92CS-6665

JUNE 20, 1946

TUBE DIVISION
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

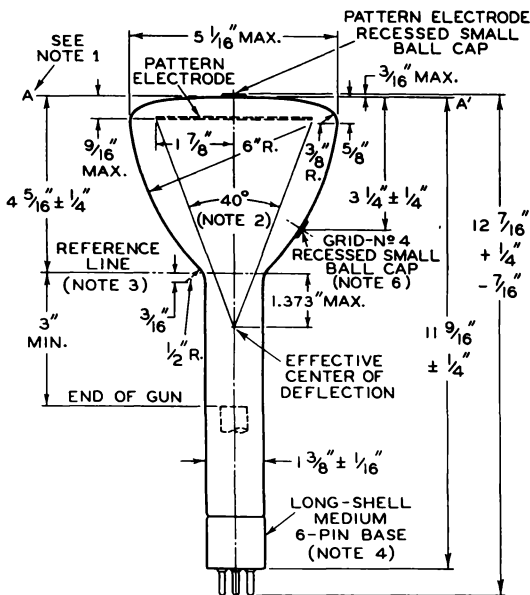
TENTATIVE DATA



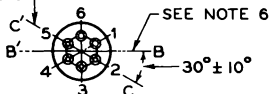
2F21

MONOSCOPE

2F21



SEE NOTE 5



BOTTOM VIEW

92CM-6653

NOTE 1: LINE AA' IS PERPENDICULAR TO THE AXIS OF THE TUBE AND INTERSECTS THE FACE CONTOUR $\frac{1}{2}$ " FROM THE AXIS OF THE TUBE.

NOTE 2: DEFLECTION ANGLE BETWEEN DIAGONALLY OPPOSITE CORNERS OF PATTERN.

NOTE 3: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE $1.438" \pm .003$ I.D. AND $2"$ LONG WILL REST ON BULB CONE.

NOTE 4: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

NOTE 5: MINOR AXIS OF PATTERN ELECTRODE MAY VARY FROM PLANE CC' THROUGH PIN 2 AND TUBE AXIS BY 10° . TOP EDGE OF PATTERN IS ON SAME SIDE OF TUBE AS PIN 5.

NOTE 6: BB' INDICATES PLANE THROUGH TUBE AXIS AND GRID-No. 4 TERMINAL.



2P23

2P23

IMAGE ORTHICON

MAGNETIC FOCUS--MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 $\pm$ 10% ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitance:

Anode to All Other Electrodes 20 μf

Photocathode Spectral Response See Curve

Image Size (4 x 3 aspect ratio). 1.6" Diagonal

Focusing Method. Magnetic

Deflection Method. Magnetic

Overall Length 15-1/4" $\pm$ 1/4"Greatest Diameter of Bulb. 3" $\pm$ 1/16"

Minimum Deflecting-Coil Inside Diameter. 2-1/8"

Deflecting-Coil Length 5" ←

Focusing-Coil Length 10" ←

Alignment-Coil Length. 15/16" ←

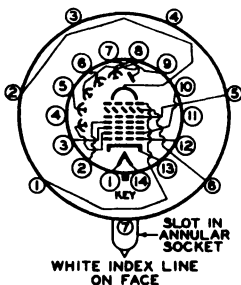
Photocathode Distance Inside End of Focusing Coil. . . . 1/2" ←

Operating Position Any except with diheptal base
up and tube axis at angle of
less than 20° from the vertical

End Base Small-Shell Diheptal 14-Pin

- Pin 1-Heater
 Pin 2-Grid No.4
 Pin 3-Grid No.3
 Pin 4-Internal Connec-
 tion—Do Not Use
 Pin 5-Dynode No.2
 Pin 6-Dynode No.4
 Pin 7-Anode
 Pin 8-Dynode No.5
 Pin 9-Dynode No.3
 Pin 10-Dynode No.1,
 Grid No.2
 Pin 11-Internal Connec-
 tion—Do Not Use
 Pin 12-Grid No.1
 Pin 13-Cathode
 Pin 14-Heater

BOTTOM VIEW
 DIRECTION OF LIGHT:
 PERPENDICULAR TO
 LARGE END OF TUBE



Shoulder Base. Jumbo Annular 7-Pin

- | | |
|---|---|
| Pin 1-Grid No.6 | Pin 5-Grid No.5 |
| Pin 2-Photocathode | Pin 6-Target |
| Pin 3-Internal Connec-
tion—Do Not Use | Pin 7-Internal Connec-
tion—Do Not Use |
| Pin 4-Internal Connec-
tion—Do Not Use | |

← Indicates a change.

2P23



2P23 IMAGE ORTHICON

→ Maximum Ratings, Absolute Values:

PHOTOCATHODE VOLTAGE	-550 max.	volts
PHOTOCATHODE ILLUMINATION.	50 max.	ft-c
OPERATING TEMPERATURE OF ANY PART OF BULB.	65 max.	°C
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE (Target Section) . . .	35 min.	°C
TEMPERATURE DIFFERENCE BETWEEN TARGET SECTION AND ANY PART OF BULB HOTTER THAN TARGET SECTION.	5 max.	°C
GRID-No.6 VOLTAGE.	-550 max.	volts
TARGET VOLTAGE:		
Positive value	50 max.	volts
Negative value	50 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE.	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts
ANODE-SUPPLY VOLTAGE*	1650 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

→ Typical Operation:

Photocathode Voltage (Image Focus) . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 80% of photocathode voltage*	-240 to -400	volts
Target Voltage*	0	volts
Grid-No.5 Voltage (Decelerator)** . .	0 to 100	volts
Grid-No.4 Voltage (Beam Focus)	160 to 240	volts
Grid-No.3 Voltage#	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage. . . .	300	volts
Grid-No.1 Voltage (For Picture Cutoff)	-15 to -85	volts
Dynode-No.2 Voltage.	600	volts
Dynode-No.3 Voltage.	880	volts
Dynode-No.4 Voltage.	1160	volts
Dynode-No.5 Voltage.	1450	volts
Anode Voltage.	1500	volts
Anode Current.	50	μamp
Target Temperature Range	35 to 60	°C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.).	35	
Minimum Peak-to-Peak Blanking Voltage	10	volts
Field Strength at Center of Focusing Coil	75	gausses

*, **, #, .: See next page.

→ Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1



2P23 IMAGE ORTHICON

2P23

Focusing-Coil Current (Approx.) for coil listed below)	75	ma
Deflecting-Coil Current (Approx. for assembly listed below):		
Horizontal (Peak to Peak).	625	ma
Vertical (Peak to Peak).	290	ma
Alignment-Coil Current (Approx. for coil listed below)	0 to 30	ma

Components:

Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket) . .	RCA Type No. 201D75
Focusing-Coil Assembly	RCA Type No. 202D75
Alignment-Coil Assembly.	RCA Type No. 204D75
Hor. Deflection Output Transformer . .	RCA Type No. 204T1
Ver. Deflection Output Transformer . .	RCA Type No. 204T2

- Ratio of dynode voltages is shown under Typical Operation.
- * For best operation, this voltage should be adjustable within $\pm 25\%$ of indicated value. For simplified equipment, this voltage can be fixed.
- Adjustable within ± 3 volts of indicated value, with blanking voltage off.
- Taps at 0, 30, 60, and 90 volts are recommended. Set at voltage giving most uniform resolution and signal output over entire picture area.
- # Adjust to give the most uniformly shaded picture near maximum signal.

OPERATING NOTES

After the 2P23 has been inserted in its sockets and the voltages applied, allow it to warm up for 1/2 to 1 hour with the camera lens iris closed. Then, proceed with normal operating adjustments.

When the equipment design or operating conditions are such that the maximum temperature rating or maximum temperature difference will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting coil and its extension. For this purpose, a small blower is satisfactory, but it should run at low speed to prevent vibration of the 2P23 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur. To keep the operating temperature of the large end of the tube from falling below 46°C , some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflection coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface.

Resolution of better than 400 lines at the center of the picture can be produced by the 2P23 when the highlight illumination is above the knee of the typical signal-output curve for this type. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 5.5 megacycles. The maximum resolution obtainable is limited by the mesh-screen portion of the target.

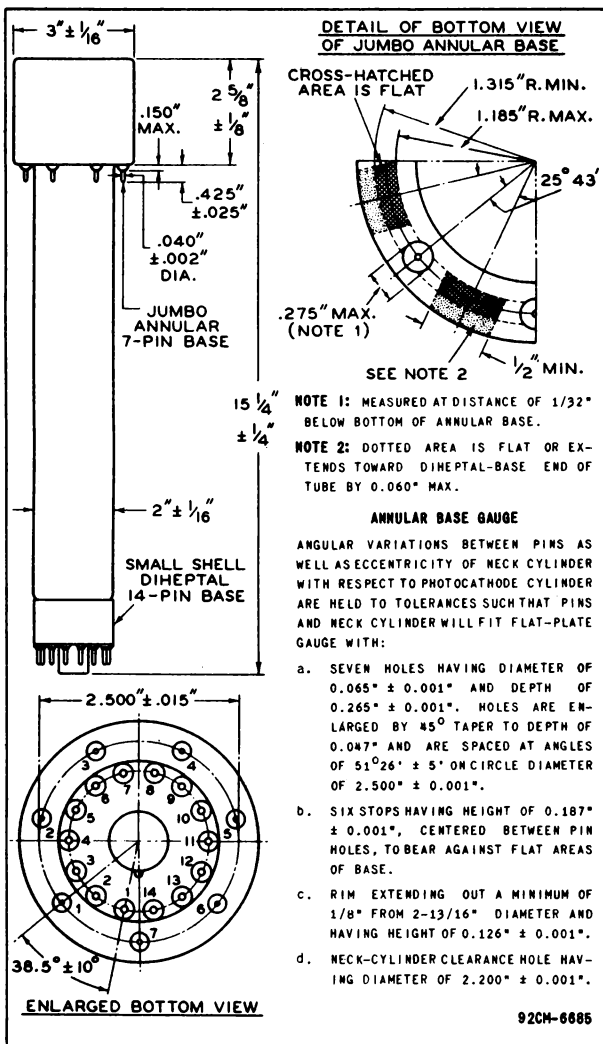
← Indicates a change.

2P23



2P23

IMAGE ORTHICON

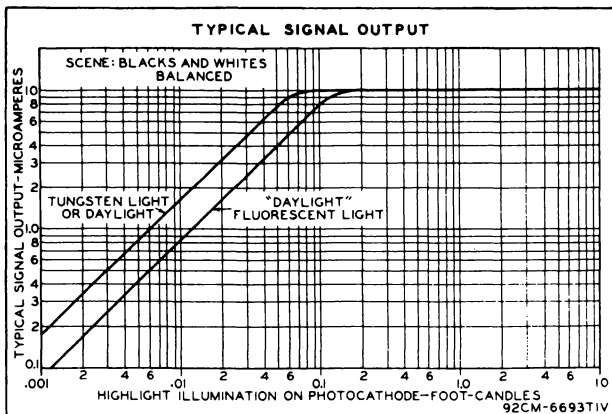




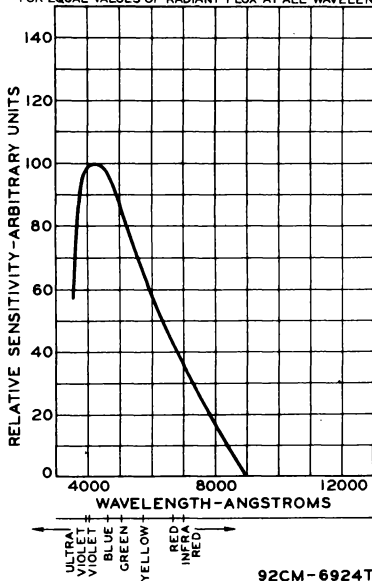
2P23

2P23

CHARACTERISTIC CURVES



SPECTRAL SENSITIVITY CHARACTERISTIC
FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



MAR. 15, 1948

TUBE DEPARTMENT

CE-6693TIV-6924T

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



3AP1-A OSCILLOGRAPH TUBE

3AP1-A

GENERAL DATA

except for those on the phosphor as indicated below,

MAXIMUM RATINGS, TYPICAL OPERATION, OUTLINE,
and

AVERAGE CHARACTERISTICS CURVES

(Anode-No.2 & Grid-No.2 Microamperes vs Grid-No.1 Volts)

for the 3AP1-A

are the same as those for Type 908-A.

Phosphor (For Curves, see front of this Section) . . .	No.1
Fluorescence	Green
Persistence	Medium

ONLY
RENE
USE
FOR



3BP1-A

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 3BP1

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 $\pm$ 10% ac or dc volts

Current. 0.6 amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.5 μ fCathode to All Other Electrodes. 8.0 μ fDJ₁ to DJ₂ 2.0 μ fDJ₃ to DJ₄ 2.0 μ fDJ₁ to All Other Electrodes. 8.0 μ fDJ₃ to All Other Electrodes. 6.0 μ fDJ₁ to All Other Electrodes except DJ₂ 6.0 μ fDJ₂ to All Other Electrodes except DJ₁ 5.0 μ fDJ₃ to All Other Electrodes except DJ₄ 4.0 μ fDJ₄ to All Other Electrodes except DJ₃ 6.0 μ f

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence. Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Overall Length 10" $\pm$ 1/4"Greatest Diameter of Bulb. 3" $\pm$ 1/16"

Minimum Useful Screen Diameter 2-3/4"

Mounting Position. Any

Base Medium Shell Diheptal 12-Pin

Basing Designation for BOTTOM VIEW 14C

Pin 1- Heater

Pin 2- Cathode

Pin 3- Grid No.1

Pin 4- Internal Con.

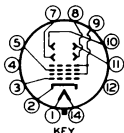
Do Not Use

Pin 5- Anode No.1

Pin 7- Deflecting

Electrode DJ₃

Pin 8- Deflecting

Electrode DJ₄

Pin 9- Anode No.2,

Grid No.2

Pin 10- Deflecting

Electrode

DJ₂

Pin 11- Deflecting

Electrode

DJ₁

Pin 12- No Conn.

Pin 14- Heater

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄ the spot is deflected toward pin 2.

The angle between the trace produced by DJ₁ and DJ₂ and its intersection with the plane through the tube axis and pin 5 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° $\pm$ 30°.

Maximum Ratings, Absolute Values:

ANODE-No.2 & GRID-No.2 VOLTAGE 2200 max. volts

ANODE-No.1 VOLTAGE 1100 max. volts

JULY 1, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1

3BP1-A



3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value.	200 max.	volts
Positive Value.	0 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE		
	550 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage [■]	1500	2000	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Volt- age for Cutoff [●]	430	575	volts
Grid-No.1 Volt. for Visual Cutoff [#]	-45	-60	volts
Max. Anode-No.1 Current Range [▲] Between	-50 and +10		μamp.
Deflection Sensitivity:			
DJ1 and DJ2	0.169	0.127 . .	mm/v dc
DJ3 and DJ4	0.229	0.172 . .	mm/v dc
Deflection Factor:**			
DJ1 and DJ2	150	200 . .	v dc/in.
DJ3 and DJ4	111	148 . .	v dc/in.

■ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.

● Individual tubes may require between +20% and -30% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to $\pm 50\%$ of these values.

▲ See curve for average values.

** Individual tubes may vary from these values by $\pm 20\%$.

Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ1 and DJ2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 max.	megohm
Resistance in Any Deflecting- Electrode Circuit ^{▲▲}	5.0 max.	megohms

▲▲ It is recommended that all deflecting-electrode-circuit resistances be approximately equal.

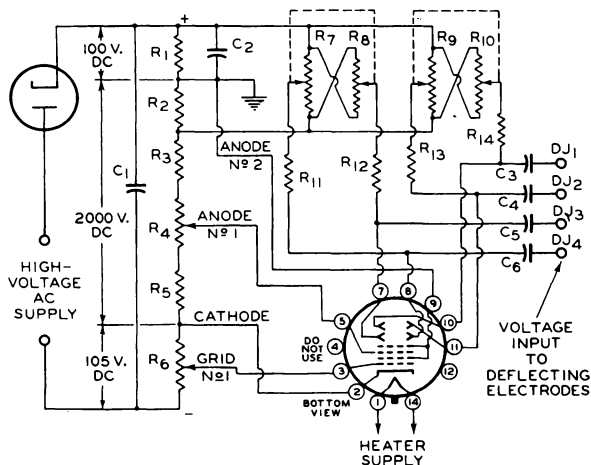


3BP1-A

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6514

C1: 0.1 μ fC2: 1.0 μ fC3 C4 C5 C6: 0.05- μ f Blocking Capacitors*

R1 R2: 2 Megohms

R3: 5.5 Megohms

R4: 2-Megohm Potentiometer

R5: 1.5 Megohms

R6: 0.5-Megohm Potentiometer

R7 R8: Dual 5-Megohm Potentiometer

R9 R10: Dual 5-Megohm Potentiometer

R11 R12 R13 R14: 2 Megohms

* When cathode is grounded, capacitors should have high voltage rating; when anode No. 2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No. 2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No. 2 and the deflecting electrodes.

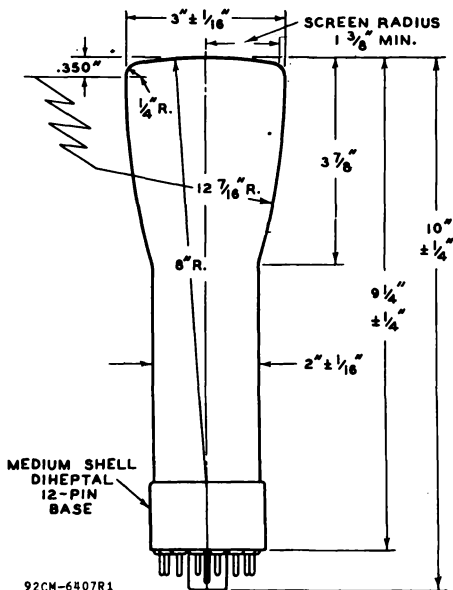
The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

3BP1-A



3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE



☉ OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM PERPENDICULAR
ERECTED AT CENTER OF BOTTOM OF BASE



3BP1-A

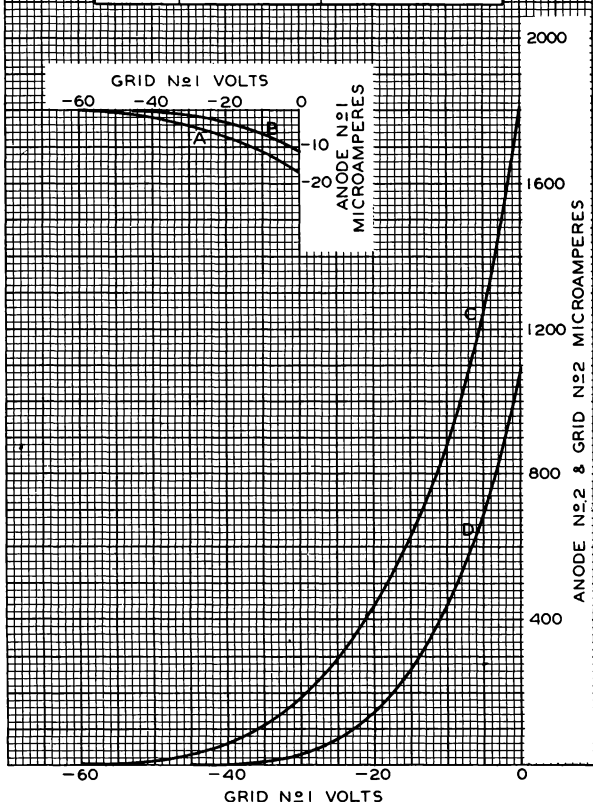
AVERAGE CHARACTERISTICS

3BP1-A

$E_f = 6.3$ VOLTS

ANODE N°1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE N°2 & GRID N°2 VOLTS
A	ANODE N°1	2000
B	ANODE N°1	1500
C	ANODE N°2 & GRID N°2	2000
D	ANODE N°2 & GRID N°2	1500



APR. 18, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6412R1

**3JP7****OSCILLOGRAPH TUBE**

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

3JP7**General:****DATA**

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8 μf ←Cathode to All Other Electrodes. 8 μf DJ₁ to DJ₂ 2.5 μf DJ₃ to DJ₄ 2 μf DJ₁ to All Other Electrodes 8 μf DJ₂ to All Other Electrodes 7 μf DJ₃ to All Other Electrodes 7 μf DJ₄ to All Other Electrodes 8 μf

Phosphor (For Curves, see front of this Section) No.7

Fluorescence Blue ←

Phosphorescence. Greenish-Yellow ←

Persistence. Long

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 10" $\pm$ 1/4"Greatest Diameter of Bulb 3" $\pm$ 1/16"

Minimum Useful Screen Diameter 2-3/4"

Mounting Position. Any

Cap Recessed Small Ball

Base Medium-Shell Diheptal 12-Pin

Basing Designation for BOTTOM VIEW 14J₁

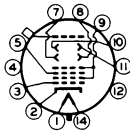
Pin 1 - Heater

Pin 2 - Cathode

Pin 3 - Grid No.1

Pin 4 - Internal
Connection-
Do Not Use

Pin 5 - Anode No.1

Pin 7 - Deflecting
Electrode
DJ₃Pin 8 - Deflecting
Electrode DJ₄Pin 9 - Anode No.2,
Grid No.2Pin 10 - Deflecting
Electrode
DJ₂Pin 11 - Deflecting
Electrode
DJ₁Pin 12 - No
ConnectionPin 14 - Heater
Cap - Anode No.3*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by DJ₁ and DJ₂ by the following angular tolerances measured about the tube axis :
Pin 5, 10°; Cap (on same side of tube as pin 5), 10°.

The angle between DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is 90° $\pm$ 3°.

← Indicates a change.

NOV. 15, 1949

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3JP7



3JP7

OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ANODE-No.3 VOLTAGE	4000 max.	volts
ANODE-No.2 [■] VOLTAGE [●]	2000 max.	volts
RATIO OF ANODE-No.3 VOLTAGE TO ANODE-No.2 VOLTAGE . . .	2.3 : 1 max.	
ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE . . .	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Equipment Design Ranges:

For any anode-No.3 voltage (E_{b3}) between 2000* and 4000 volts
and any anode-No.2 voltage (E_{b2}) between 1500** and 2000 volts

Anode-No.1 Voltage	20% to 34.5% of E_{b2}	volts
Max. Grid-No.1 Voltage for Visual Cutoff	4.5% of E_{b2}	volts
Anode-No.1 Current for any Operating Condition	-50 to +10	μ amp

Deflection Factors:

$$\text{When } E_{b3} = 2 \times E_{b2}$$

DJ1 & DJ2	85 to 115	v dc/in./kv of E_{b2}
DJ3 & DJ4	62.5 to 85	v dc/in./kv of E_{b2}

$$\text{When } E_{b3} = E_{b2}$$

DJ1 & DJ2	68 to 92	v dc/in./kv of E_{b2}
DJ3 & DJ4	50 to 68	v dc/in./kv of E_{b2}

Examples of Use of Design Ranges:

For anode-No.3 voltage of	2000	3000	4000	volts
and anode-No.2 voltage of	2000	1500	2000	volts
Anode-No.1 Voltage	400-690	300-515	400-690	volts
Max. Grid-No.1 Voltage for Visual Cutoff	-90	-67.5	-90	volts
Deflection Factors:				
DJ1 & DJ2	136-184	127-173	170-230	v dc/in.
DJ3 & DJ4	100-136	94-128	125-170	v dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in any Deflecting- Electrode Circuit [○]	5.0 max.	megohms

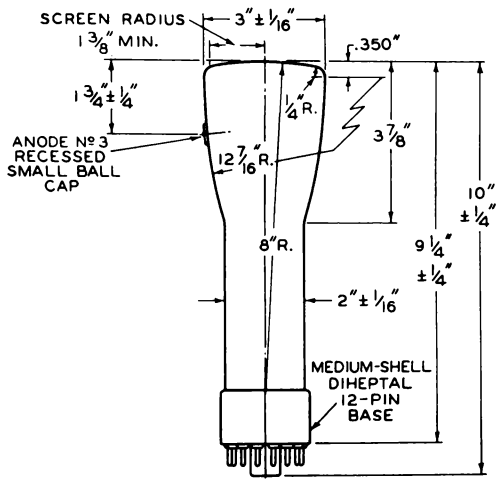
■, ●, **, ○: See next page.



3JP7

3JP7 OSCILLOGRAPH TUBE

- Anode No.2 and grid No.2, which are connected together within tube, are referred to herein as anode No.2.
- The product of anode-No.2 voltage and average anode-No.2 current should be limited to 6 watts.
- * It is recommended that anode-No.3 voltage be not less than 3000 volts for high-speed transients.
- ** Recommended minimum value of anode-No.2 voltage.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



Q OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF BASE.

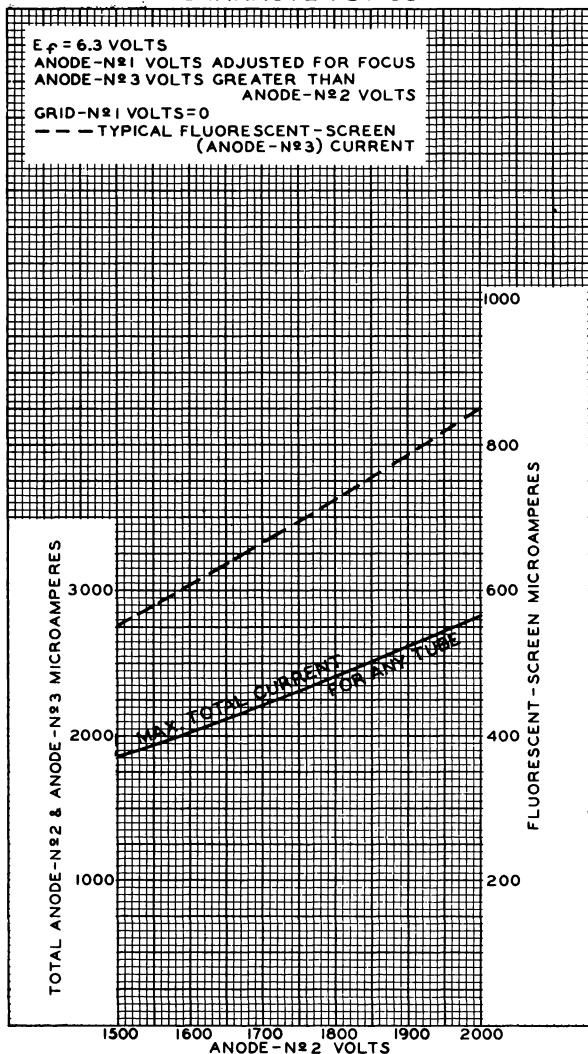
92CM-6583

3JP7



3JP7

CHARACTERISTICS





3JP7

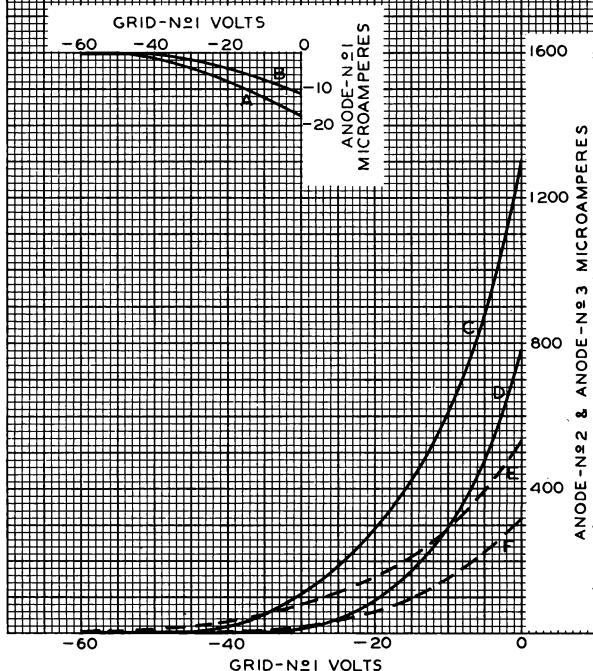
3JP7

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

ANODE-Nº1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE-Nº2 VOLTS	ANODE-Nº3 VOLTS
A	ANODE Nº 1	2000	4000
B	ANODE Nº 1	1500	3000
C	ANODE Nº 2	2000	4000
D	ANODE Nº 2	1500	3000
E	ANODE Nº 3	2000	4000
F	ANODE Nº 3	1500	3000



APR. 24, 1945

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6421R1



3KP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp ←

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes 8 μf

Deflecting electrode DJ1 to

deflecting electrode DJ2. 2.5 μf

Deflecting electrode DJ3 to

deflecting electrode DJ4. 2.5 μf DJ1 to all other electrodes 11 μf DJ2 to all other electrodes 8 μf DJ3 to all other electrodes 7 μf DJ4 to all other electrodes 8 μf

Faceplate Clear Glass ←

Phosphor (For Curves, see front of this Section). P1

Fluorescence. Green

Phosphorescence Green ←

Persistence Medium

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length. $11\frac{1}{2}'' \pm \frac{1}{4}''$ Greatest Diameter of Eulb $3'' \pm \frac{1}{16}''$ Minimum Useful Screen Diameter. $2\frac{3}{4}''$

Weight (Approx.). 9 oz ←

Mounting Position Any ←

Eulb. J-24 ←

Base. Medium-Shell Magnal 11-Pin (JETEC No. B11-66) ←

Basing Designation for BOTTOM VIEW. 11M

Pin 1 - Heater

Pin 2 - Grid No.1

Pin 3 - Cathode

Pin 4 - Grid No.3

Pin 5 - Deflecting

Electrode

DJ3

Pin 6 - Deflecting

Electrode

DJ4

Pin 7 - Ultor

(Grid No.2,

Grid No.4,

Collector)

Pin 8 - Deflecting

Electrode

DJ2

Pin 9 - Deflecting

Electrode

DJ1

Pin 10 - Internal

Connection-

Do Not Use

Pin 11 - Heater

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

← Indicates a change.

3KP1



3KP1

OSCILLOGRAPH TUBE

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 4. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The plane through the tube axis and pin 1 may vary from the trace produced by DJ₃ and DJ₄ by $\pm 10^\circ$ (measured about the tube axis).

The angle between DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is $90^\circ \pm 3^\circ$.

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	2500 max.	volts
→ ULTOR INPUT (AVERAGE)	6 max.	watts
GRID-No.3 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND		
ANY DEFLECTING ELECTRODE.	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	125 max.	volts
Heater positive with respect to cathode .	125 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c4}) between
recommended minimum* and 2500 volts

Grid-No.3 Voltage for Focus	16% to 30% of E_{c4}	volts
→ Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot.	1.9% to 4.5% of E_{c4}	volts
Grid-No.3 Current for Any Operating Condi- tion.	-15 to +10	μ amp
Deflection Factors:		
DJ ₁ & DJ ₂	50 to 68	v dc/in./kv of E_{c4}
DJ ₃ & DJ ₄	38 to 52	v dc/in./kv of E_{c4}
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of 1000 2000 volts

Grid-No.3 Voltage for Focus	160 to 300	320 to 600	volts
--	------------	------------	-------

* Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 3KP1 in general service is 1000 volts but a value as low as 500 volts may be used under conditions of low-velocity deflection and low ambient-light levels.

The center of the undeflected focused spot will fall within a circle having 7.5-mm radius concentric with the center of the tube face.

→ Indicates a change.



3KPI

3KPI

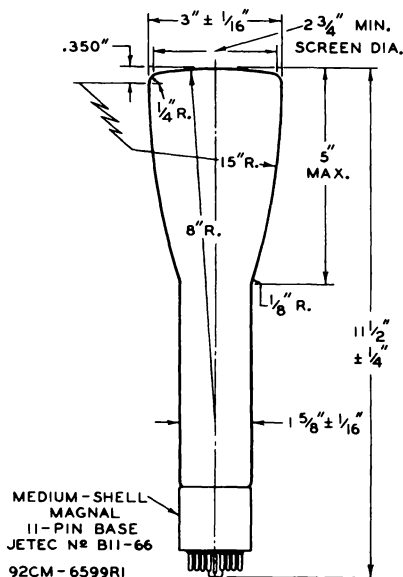
OSCILLOGRAPH TUBE

For ultor voltage of	1000	2000	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-19 to -45	-38 to -90	volts ←
Deflection Factors:			
DJ1 & DJ2.	50 to 68	100 to 136	volts dc/in.
DJ3 & DJ4.	38 to 52	76 to 104	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting Electrode Circuit [■]	5 max.	megohms

■ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



☐ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

← Indicates a change.

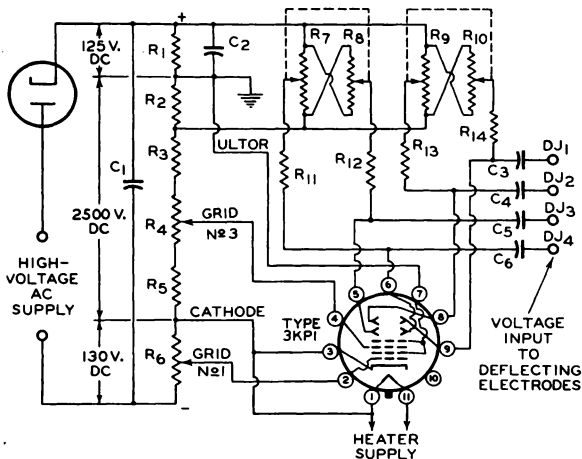
3KPI



3KPI

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6690R2

- C1: 0.1 μ f, 3000 Volts
 C2: 1.0 μ f, 200 Volts
 C3 C4 C5 C6: 0.05- μ f Blocking Capacitors*
 R1 R2: 2 Megohms, 0.5 Watt
 R3: 6 Megohms, 0.5 Watt
 R4: 2-Megohm Potentiometer, 0.5 Watt
 R5: 1.0 Megohm, 0.5 Watt
 R6: 0.5-Megohm Potentiometer, 0.5 Watt
 R7 R8: Dual 5-Megohm Potentiometer, 0.5 Watt
 R9 R10: Dual 5-Megohm Potentiometer, 0.5 Watt
 R11 R12 R13 R14: 2 Megohms, 0.5 Watt

* When cathode is grounded, capacitors should have high voltage rating (3000 volts); when ultor is grounded, they may have low voltage rating (200 volts). For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that ultor be returned to a point in the amplifier system which will give the lowest possible potential difference between ultor and the deflecting electrodes.

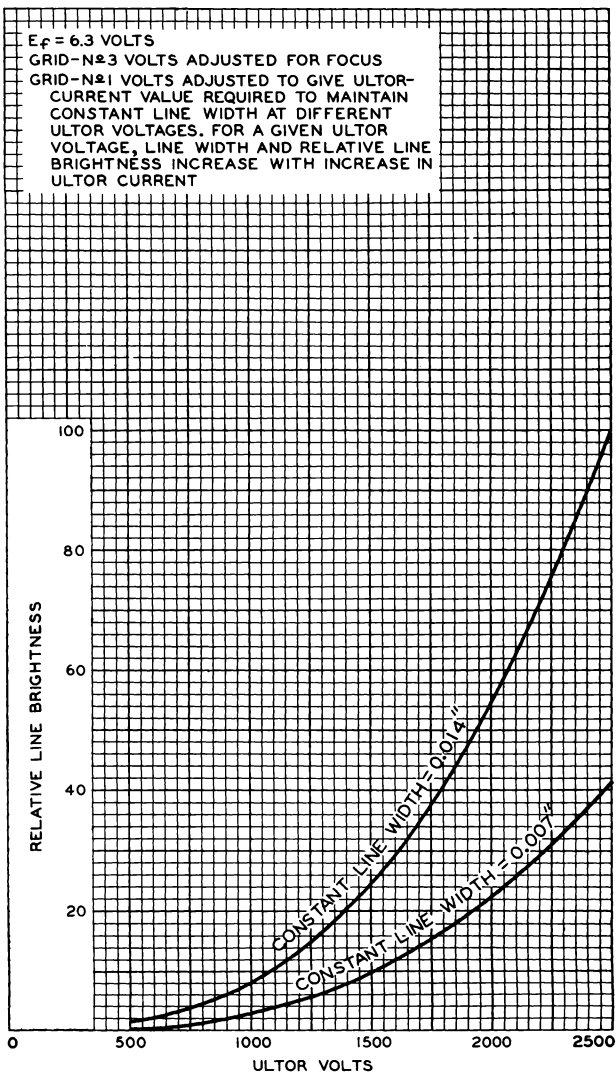
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3KPI

3KPI

CHARACTERISTICS

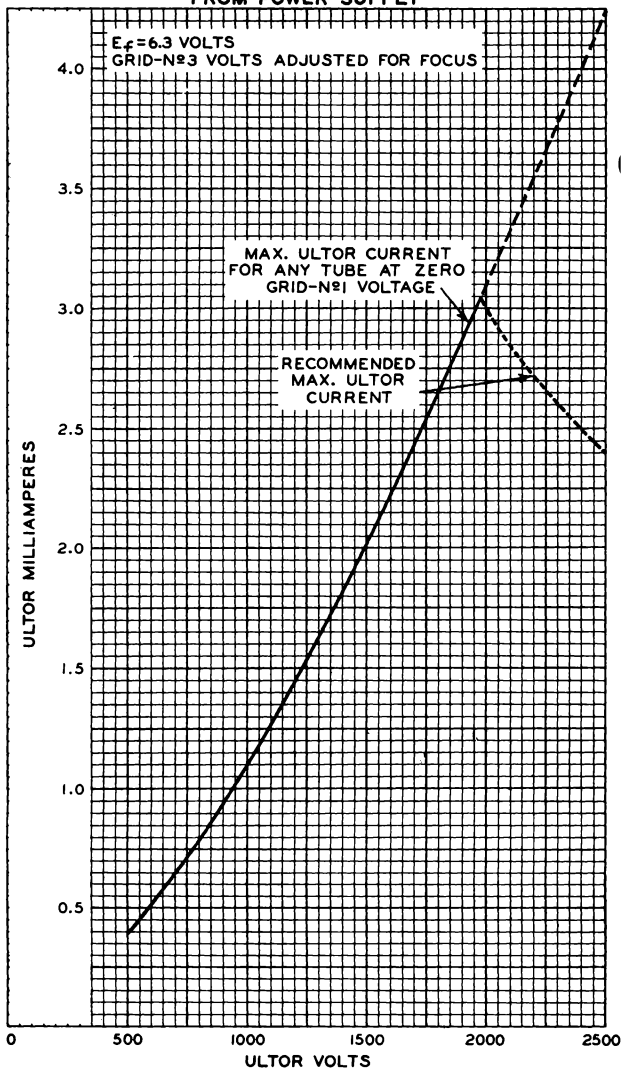


3KPI



3KPI

MAXIMUM ULTOR-CURRENT REQUIREMENTS FROM POWER SUPPLY

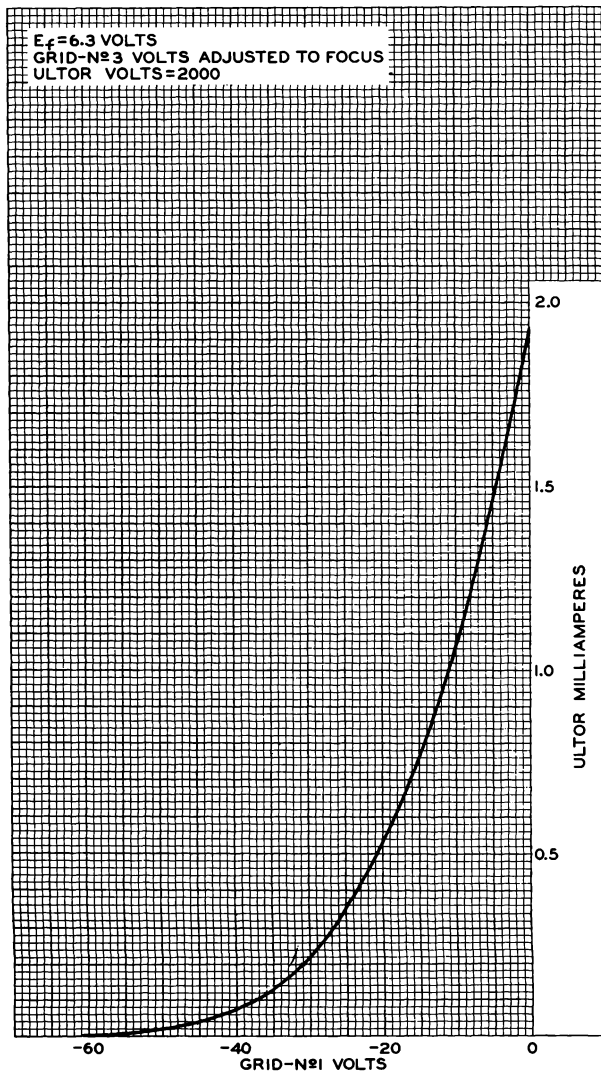




3KP1

3KP1

AVERAGE CHARACTERISTIC



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6658R2



3KP4

3KP4
TO
3KP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 3KP4 is the same as the 3KP1 except for the following items:

General:

Phosphor (For curves, see front of this section). . .P4—Sulfide Type
Fluorescence. White
Phosphorescence White
Persistence Short

In general, operation of the 3KP4 at an ultor voltage less than 1500 volts is not recommended.

**The PERSISTENCE CHARACTERISTICS
of the P4-sulfide phosphor are the same as those shown for
the P11 phosphor at the front of this Section**

3KP7

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 3KP7 is the same as the 3KP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section).P7
Fluorescence. Blue
Persistence Short
Phosphorescence Greenish-Yellow
Persistence Long

In general, operation of the 3KP7 at an ultor voltage less than 1500 volts is not recommended.

3KP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 3KP11 is the same as the 3KP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section). P11
Fluorescence. Blue
Phosphorescence Blue
Persistence Short

In general, operation of the 3KP11 at an ultor voltage less than 1500 volts is not recommended.



3MPI

3MPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Cathode to All Other Electrodes 2.2

Grid No.1 to All Other Electrodes 10.3

DJ₁ to DJ₂ 1.3 μ fDJ₃ to DJ₄ 1.2 μ fDJ₁ to All Other Electrodes Except DJ₂ 4.4 μ fDJ₂ to All Other Electrodes Except DJ₁ 5.6 μ fDJ₃ to All Other Electrodes Except DJ₄ 5.0 μ fDJ₄ to All Other Electrodes Except DJ₃ 4.5 μ f

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence Medium

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 8" $\pm$ 1/4"Greatest Diameter of Bulb 3" $\pm$ 1/16"

Minimum Useful Screen Diameter 2-3/4"

Mounting Position Any

Base Small-Shell Duodecal 12-Pin

Basing Designation for Bottom View 12F

Pin 1-Heater

Pin 2-Grid No.1

Pin 3-Anode No.1

Pin 4-Deflecting Electrode

Pin 5-Deflecting Electrode

Pin 6-No

Pin 7-Deflecting Electrode

Pin 8-Deflecting Electrode

Pin 9-Anode No.2, Grid No.2

Pin 10-No

Pin 11-Cathode

Pin 12-Heater

DJ₁ and DJ₂ are nearer the screenDJ₃ and DJ₄ are nearer the base

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 4. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The plane through the tube axis and pin 4 may vary from the trace produced by DJ₁ and DJ₂ by an angular tolerance (measured about the tube axis) of 10°.

Maximum Ratings, Design-Center Values:

ANODE-No.2* VOLTAGE# 2500 max. volts

* Anode No.2 and grid No.2 which are connected together within tube, are referred to herein as anode No.2.

The product of anode-No.2 voltage and average anode-No.2 current should be limited to 6 watts.

3MP1



3MP1

OSCILLOGRAPH TUBE

ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE. . .	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between
recommended minimum* and 2500 volts

Anode-No.1 Voltage . . .	20% to 35% of E_{b2}	volts
Max. Grid-No.1 Voltage for Visual Cutoff	6.3% of E_{b2}	volts
Anode-No.1 Cur. for any Operating Condition.	-15 to +10	microamperes
Deflection Factors:		
DJ ₁ & DJ ₂	115 to 145 vdc/in./kv of E_{b2}	
DJ ₃ & DJ ₄	110 to 140 vdc/in./kv of E_{b2}	

Examples of Use of Design Ranges:

For anode-No.2 voltage of	1000	2000	volts
Anode-No.1 Voltage . . .	200-350	400-700	volts
Max. Grid-No.1 Voltage for Visual Cutoff	-63	-126	volts
Deflection Factors:			
DJ ₁ & DJ ₂	115-145	230-290	volts dc/in.
DJ ₃ & DJ ₄	110-140	220-280	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting- Electrode Circuit [□]	5.0 max.	megohms

* Brilliance and definition decrease with decreasing anode-No.2 voltage. Recommended minimum for the 3MP1 in general service is 1000 volts but a value as low as 500 volts may be used under conditions of low-velocity deflection and low ambient-light levels.

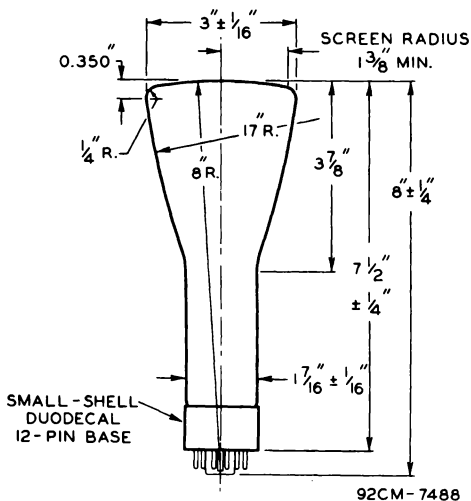
□ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



3MPI

3MPI

OSCILLOGRAPH TUBE





3RP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

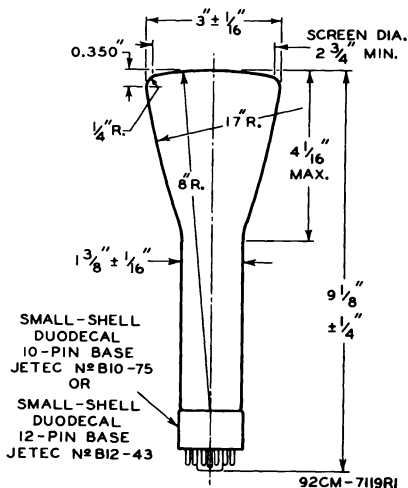
ELECTROSTATIC DEFLECTION

3RP1

The 3RP1 is the same as the 3RP1-A except for the following items:

General:

Faceplate. Spherical Clear Glass
Bulb J-24P1
Weight (Approx.) 7 oz



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.



3RP1-A

3RP1-A OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes 8 μf
Deflecting electrode DJ₁ to
deflecting electrode DJ₂ 2 μf
Deflecting electrode DJ₃ to
deflecting electrode DJ₄ 2 μf
DJ₁ to all other electrodes 11 μf
DJ₂ to all other electrodes 8 μf
DJ₃ to all other electrodes 7 μf
DJ₄ to all other electrodes 8 μf

Faceplate Flat Clear Glass

Phosphor (For Curves, see front of this Section). P1

Fluorescence. Green

Phosphorescence Green

Persistence Medium

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length. $9\frac{1}{8}'' \pm \frac{1}{4}''$ Greatest Diameter of Bulb $3'' \pm \frac{1}{16}''$ Minimum Useful Screen Diameter. $2\frac{3}{4}''$

Mounting Position Any

Weight (Approx.). 12 oz

Bulb. J-24S1

Base. Small-Shell Duodecal 10-Pin (JETEC No.B10-75),
or Small-Shell Duodecal 12-Pin (JETEC No.B12-43)

Basing Designation for BOTTOM VIEW. 12E

Pin 1 - Heater

Pin 2 - Grid No.1

Pin 3 - Cathode

Pin 4 - Grid No.3

Pin 5▲ - Internal
Connection-
Do Not Use

Pin 6 - Deflecting
Electrode
DJ₃

Pin 7 - Deflecting
Electrode
DJ₄

Pin 8 - Ultor

(Grid No.2,

Grid No.4,

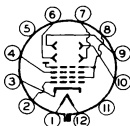
Collector)

Pin 9 - Deflecting
Electrode
DJ₂

Pin 10 - Deflecting
Electrode
DJ₁

Pin 11▲ - Internal
Connection-
Do Not Use

Pin 12 - Heater

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

▲ Pins 5 and 11 are omitted from the 10-pin base.

3RP1-A



3RP1-A

OSCILLOGRAPH TUBE

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 4. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The plane through the tube axis and pin 1 may vary from the trace produced by DJ₃ and DJ₄ by 10° (measured about the tube axis).

The angle between DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is 90° ± 30°.

Maximum Ratings, Design-Center Values:

ULTOR ⁰ VOLTAGE	2500 max.	volts
ULTOR INPUT (AVERAGE).	6 max.	watts
GRID-No.3 VOLTAGE.	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND		
ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c4}) between 500* and 2500 volts

Grid-No.3 Voltage		
for Focus.	16.5% to 31% of E_{c4}	volts
Maximum Grid-No.1		
Voltage for Visual		
Extinction of Un-		
deflected Focused		
Spot	-6.75% of E_{c4}	volts
Grid-No.3 Current for		
Any Operating Con-		
dition		
	-15 to +10	μamp
Deflection Factor:		
DJ ₁ & DJ ₂	73 to 99	v dc/in./kv of E_{c4}
DJ ₃ & DJ ₄	52 to 70	v dc/in./kv of E_{c4}
Spot Position.	##	

⁰ The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 3RP1-A, the ultor function is performed by grid No.4. Since grid No.4, grid No.2, and collector are connected together within the 3RP1-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* Brilliance and definition decrease with decreasing ultor voltage. A value as low as 500 volts is recommended only for low-velocity deflection and low ambient-light levels.

The center of the undeflected focused spot will fall within a circle having 7.5-mm radius concentric with the center of the tube face.



3RP1-A

OSCILLOGRAPH TUBE

3RP1-A

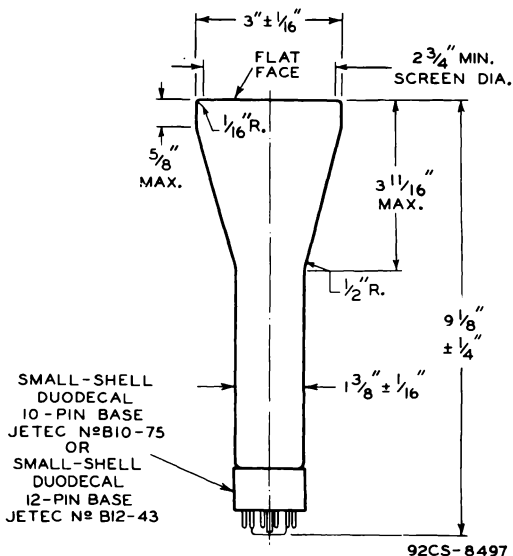
Examples of Use of Design Ranges:

For ultor voltages of	1000	2000	volts
Grid-No.3 Voltage			
for Focus.	165 to 310	330 to 620	volts
Maximum Grid-No.1			
Voltage for Visual			
Extinction of Un-			
deflected Focused			
Spot	-67.5	-135	volts
Deflection Factors:			
DJ ₁ & DJ ₂	73 to 99	146 to 198	volts dc/in.
DJ ₃ & DJ ₄	52 to 70	104 to 140	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-		
Electrode Circuit	5 max.	megohms

■ It is recommended that the deflecting-electrode circuit resistances be approximately equal.



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

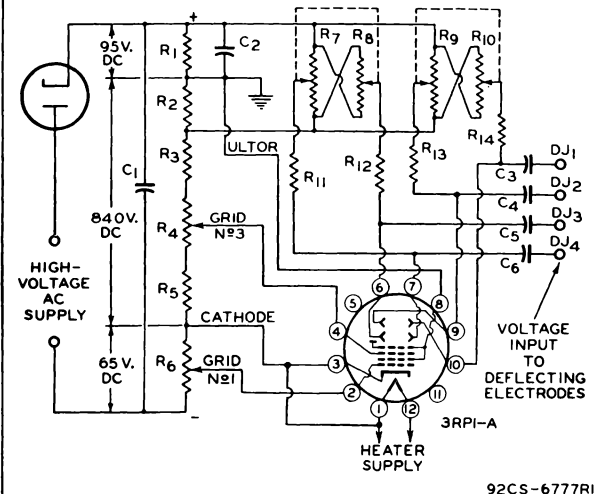
3RP1-A



3RP1-A

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.2 μ f
 C2: 1.0 μ f
 C3 C4 C5 C6: 0.05- μ f Blocking
 Capacitors
 R1 R2: 2.5 Megohms, 0.5 Watt
 R3: 2.5 Megohms, 1 Watt

R4: 1.0-Megohm Potentiometer
 R5: 0.5 Megohm, 0.5 Watt
 R6: 0.35 Megohm, 0.5 Watt
 R7 R8: Dual 5-Megohm Potentiometer
 R9 R10: Dual 5-Megohm Potentiometer
 R11 R12 R13 R14: 2 Megohms, 0.5 Watt

* When cathode is grounded, capacitors should have high voltage rating; when ultor is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that ultor be returned to a point in the amplifier system which will give the lowest possible potential difference between ultor and the deflecting electrodes.

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JULY 1, 1955

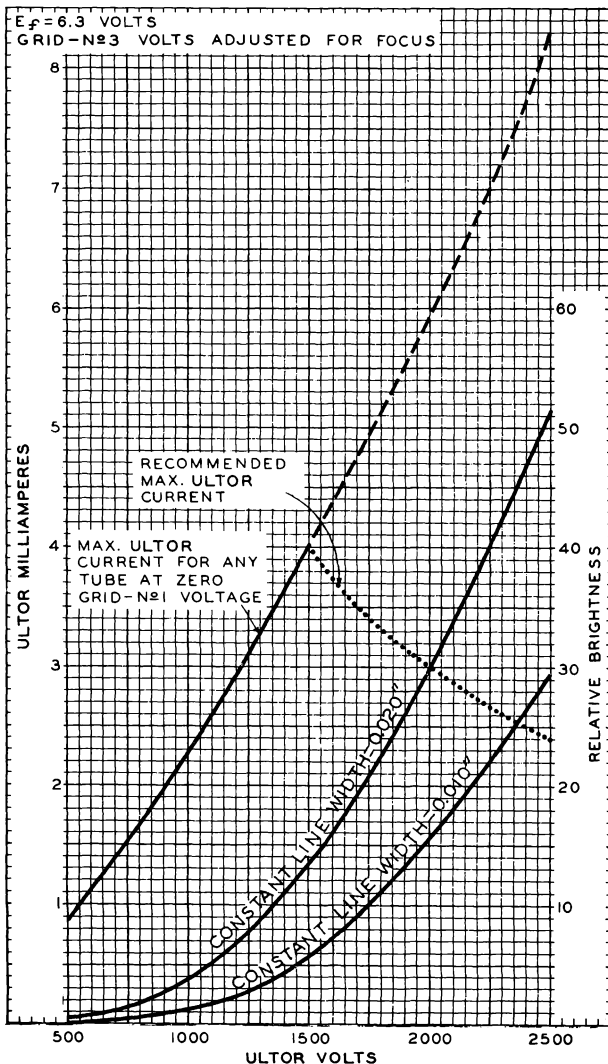
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3RP1-A CHARACTERISTICS

3RP1-A



MAR. 24, 1955

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

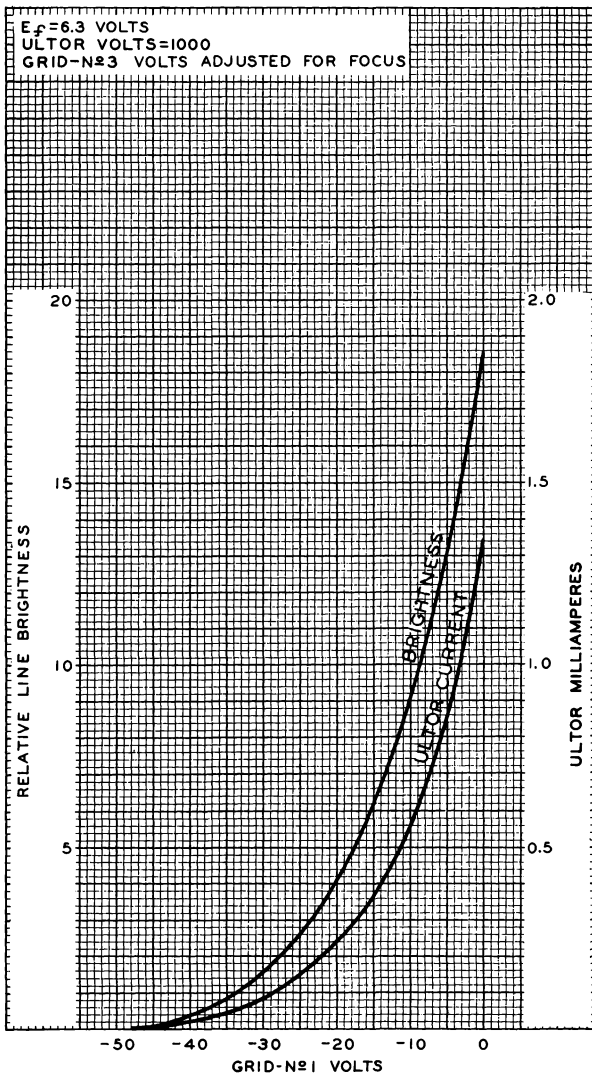
92CM-7143RI

3RPI-A



3RPI-A

AVERAGE CHARACTERISTICS



MAR. 24, 1955

TUBE DIVISION
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7141R1



3RP4

3RP4

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 3RP4 is the same as the 3RP1 except for the following items:

General:

Phosphor (For curves, see front of this Section) . P4—Sulfide Type
Fluorescence White
Phosphorescence. White
Persistence. Short

In general, operation of the 3RP4 at an ultor voltage less than 1500 volts is not recommended.



5ABPI

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

5ABPI

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 8 $\mu\mu\text{f}$
Cathode to All Other Electrodes 5 $\mu\mu\text{f}$
DJ₁ to DJ₂ 2.5 $\mu\mu\text{f}$
DJ₃ to DJ₄ 1.3 $\mu\mu\text{f}$
DJ₁ to All Other Electrodes 9 $\mu\mu\text{f}$
DJ₂ to All Other Electrodes 9 $\mu\mu\text{f}$
DJ₃ to All Other Electrodes 5 $\mu\mu\text{f}$
DJ₄ to All Other Electrodes 6 $\mu\mu\text{f}$

Faceplate, Flat Clear Glass

Phosphor (For Curves, see front of this Section). P1

Fluorescence and Phosphorescence Green

Persistence of Phosphorescence Medium

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 16-3/4" $\pm$ 3/8"

Greatest Diameter of Bulb 5-1/4" $\pm$ 3/32"

Minimum Useful Screen Diameter 4-9/16"

Bulb J42

Weight (Approx.) 2-1/2 lbs

Mounting Position Any

Cap Recessed Small Ball (JETEC No.J1-22)

Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Cathode
Pin 3 - Grid No.1
Pin 4 - No Con-
 nection—
 Do Not Use
Pin 5 - Grid No.3
Pin 7 - Deflecting
 Electrode DJ₃
Pin 8 - Deflecting
 Electrode DJ₄



Pin 9 - Ultor
 (Grid No.2,
 Grid No.4)
Pin 10 - Deflecting
 Electrode DJ₂
Pin 11 - Deflecting
 Electrode DJ₁
Pin 12 - No. Conn.
Pin 14 - Heater
 Cap - Post-Ultor
 (Grid No.5,
 Collector)

*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by DJ₁ and DJ₂ by

5ABPI



5ABPI OSCILLOGRAPH TUBE

the following angular tolerances (measured about the tube axis): Pin 5, 10° ; side terminal (on same side of tube as pin 5), 10° . Angle between $DJ_1 - DJ_2$ trace and $DJ_3 - DJ_4$ trace is $90^\circ \pm 1.5^\circ$.

Maximum Ratings, Design-Center Values:

POST-ULTOR [•] VOLTAGE	6000 max.	volts
ULTOR [▲] VOLTAGE	2600 max.	volts
RATIO OF POST-ULTOR VOLTAGE TO ULTOR VOLTAGE	2.3:1 max.	
GRID-No.3 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value [○]	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any post-ultor voltage (E_{C5}) between 2000^{*} and 6000 volts
and any ultor voltage (E_{C4}) between 1500^{**} and 2600 volts

Grid-No.3 Voltage for Focus . . 20% to 34.5% of E_{C4} . . . volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot 2.6% to 4.3% of E_{C4} . . . volts

Grid-No.3 Current for Any

Operating Condition -15 to +10 . . . μ amp

Deflection Factors: #

$$\text{When } E_{C5} = 2 \times E_{C4}$$

DJ_1 & DJ_2 26.5 to 36 v dc/in./kv of E_{C4}

DJ_3 & DJ_4 18 to 24 v dc/in./kv of E_{C4}

$$\text{When } E_{C5} = E_{C4}$$

DJ_1 & DJ_2 21.5 to 29 v dc/in./kv of E_{C4}

DJ_3 & DJ_4 14.5 to 19.5 v dc/in./kv of E_{C4}

Spot Position

##

Examples of Use of Design Ranges:

For post-ultor voltage of	2000	3000	4000	volts
and ultor voltage of	2000	1500	2000	volts
Grid-No.3 Volt.				
for Focus	400 to 690	300 to 515	400 to 690	volts
Grid-No.1 Volt. [□]	-52 to -87	-39 to -65	-52 to -87	volts

•, ▲, ○, *, **, #, ##, □: See next page.

JUNE 1, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1



5ABPI

5ABPI

OSCILLOGRAPH TUBE

Deflection Factors:

DJ ₁ & DJ ₂	43 to 58	40 to 54	53 to 72	v dc/in.
DJ ₃ & DJ ₄	29 to 39	27 to 36	36 to 48	v dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

Resistance in Any Deflecting-

Electrode Circuit[■] 5.0 max. megohms

● The "post-ultor" in a cathode-ray tube is the electrode to which is applied a dc voltage higher than the ultor voltage for accelerating the electrons in the beam after its deflection. In the 5AB-types, the post-deflection acceleration function and the collector function are both performed by grid No.5 which is conveniently referred to as "post-ultor".

▲ The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 5AB-types, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 5AB-types, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

○ At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.

* It is recommended that the post-ultor voltage be not less than 3000 volts for high-speed scanning.

** Recommended minimum value of ultor voltage.

The deflecting electrodes DJ₃ and DJ₄ are designed to have extra-high deflection sensitivity and consequently produce less than full-screen deflection. With post-deflection acceleration, the length of deflection may be limited to 4 inches; without post-deflection acceleration, deflection to full screen diameter will ordinarily be obtained. These electrodes are, therefore, more suitable for the signal voltage than for the time-base voltage.

With heater voltage of 6.3 volts, post-ultor voltage of 4000 volts, ultor voltage of 2000 volts, grid-No.3 voltage adjusted to give focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through a 1-megohm resistor to ultor, and tube shielded from all extraneous fields, the center of the undeflected, focused spot will fall within a circle having a 12.5-mm radius concentric with the center of the tube face.

□ For visual cutoff of undeflected focused spot.

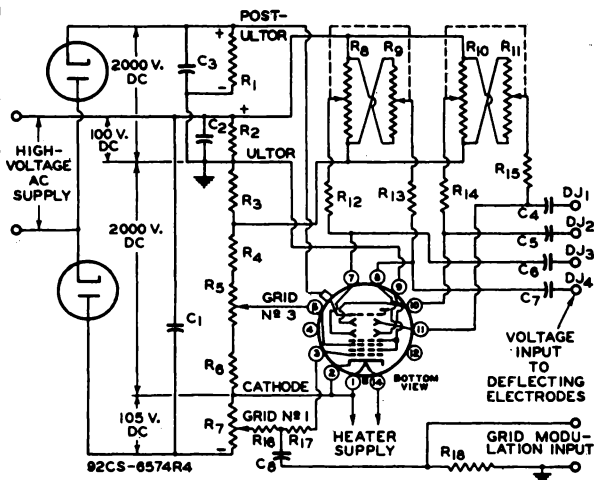
■ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



SABPI

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μ f, 2500 Volts
C2: 1.0 μ f, 200 Volts
C3: 0.1 μ f, 2500 Volts
C4 C5 C6 C7: 0.05- μ f,
Blocking Capacitors★
C8: 0.0001 μ f, 2500 Volts
R1: 50 Megohms (Five 10-Meg-
ohm, 1-Watt Resistors
In Series)
R2 R3: 2 Megohms, 0.5 Watt
R4: 5.5 Megohms, 2 Watts

R5: 2-Megohm Potentiometer
R6: 1.5 Megohms, 0.5 Watt
R7: 0.5-Megohm Potentiometer
R8 R9: 5-Megohm Potentiometer
R10 R11: Dual 5-Megohm Potentiometer
R12 R13 R14 R15: 2 Megohms, 0.5 Watt
R16: 0.5 Megohm, 0.5 Watt
R17: Not less than 2000 ohms per
volt of positive signal
R18: 5 Megohms, 0.5 watt

When cathode is grounded, capacitors should have high voltage rating (2500 volts); when ultor is grounded, they may have low voltage rating (200 volts). For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that ultor be returned to a point in the amplifier system which will give the lowest possible potential difference between ultor and the deflecting electrodes.

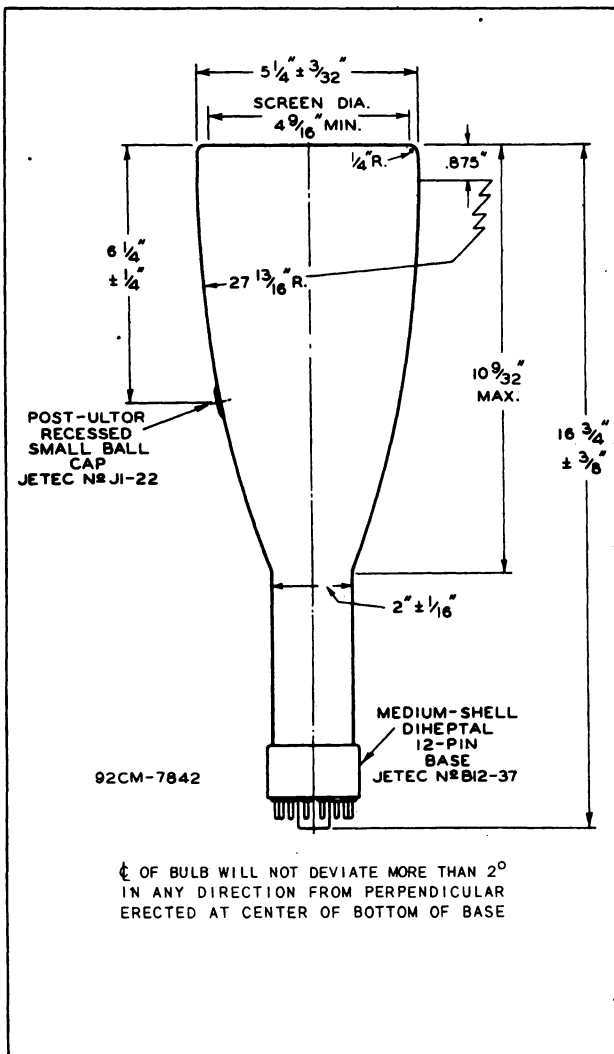
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OSCILLOGRAPH TUBE

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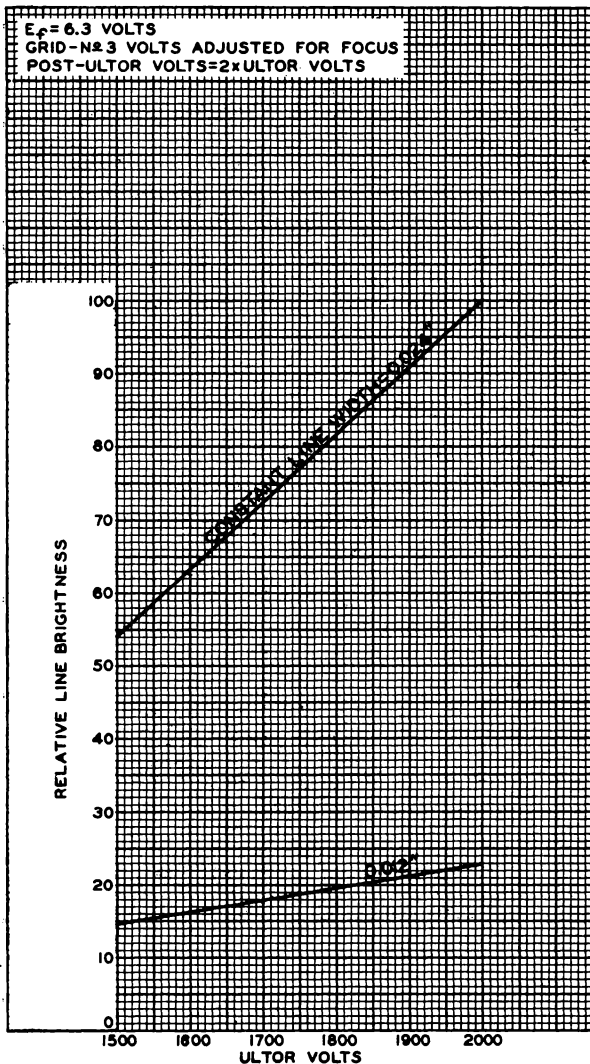
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TYPICAL CHARACTERISTICS



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92CM-6820RI

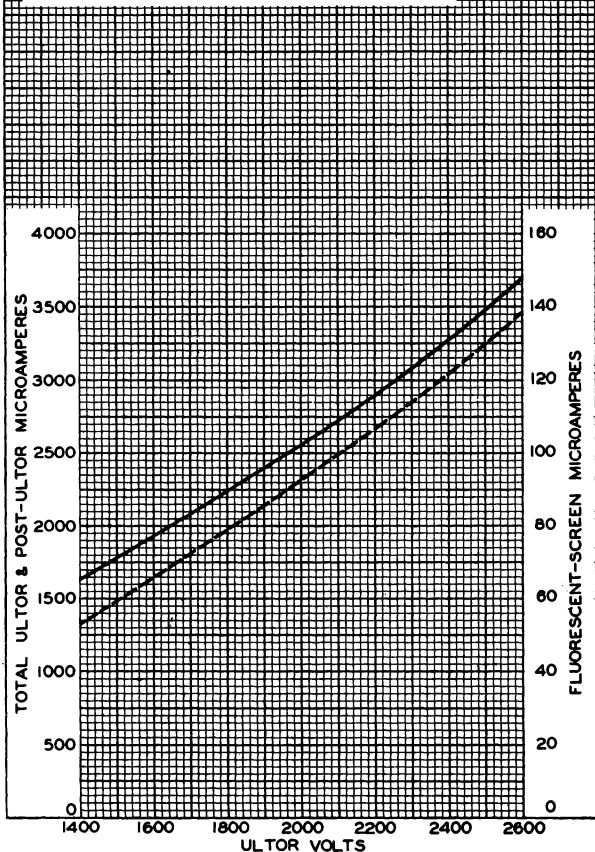


5ABPI

CHARACTERISTICS

$E_f = 6.3$ VOLTS
GRID-№3 VOLTS ADJUSTED FOR FOCUS
POST-ULTOR (GRID № 5 & COLLECTOR) VOLTS
GREATER THAN ULTOR (GRIDS № 2 & № 4)
VOLTS
GRID-№1 VOLTS = 0

— MAX. TOTAL CURRENT FOR ANY TUBE
--- TYPICAL FLUORESCENT-SCREEN
(POST-ULTOR) CURRENT



FEB. 3, 1953

TUBE DEPARTMENT
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92CM-7910

5ABPI



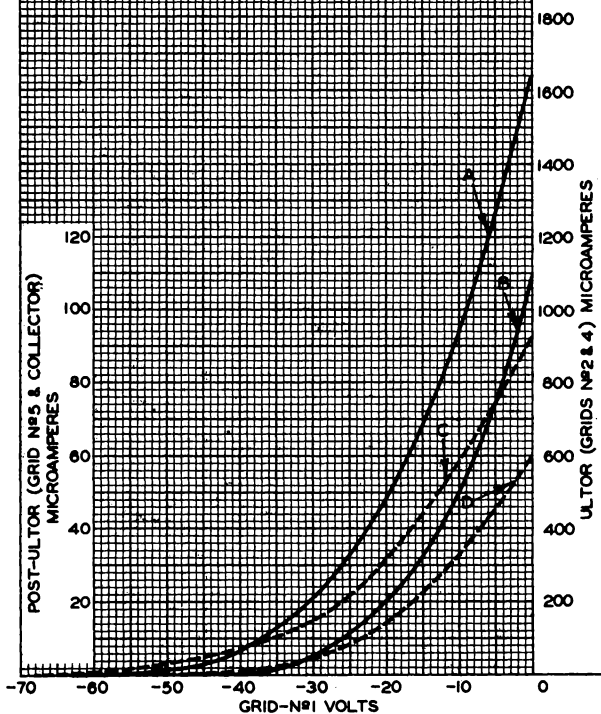
5ABPI

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

GRID-№3 VOLTS ADJUSTED FOR FOCUS

CURVE	ELECTRODE CURRENT	ULTOR VOLTS	POST-ULTOR VOLTS
A	ULTOR	2000	4000
B	ULTOR	1500	3000
C	POST-ULTOR	2000	4000
D	POST-ULTOR	1500	3000





5ABP4
TO
5ABP11

5ABP4 OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5ABP4 is the same as the 5ABP1 except for the following items:

General:

Phosphor (For curves, see front of this section). . P4—Sulfide Type
Fluorescence. White
Phosphorescence White
Persistence Short

THE PERSISTENCE CHARACTERISTICS

of the P4-sulfide phosphor are the same as those shown for
the P11 phosphor at the front of this Section

5ABP7 OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5ABP7 is the same as the 5ABP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section). P7
Fluorescence. Blue
Persistence Short
Phosphorescence Greenish-Yellow
Persistence Long

5ABP11 OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5ABP11 is the same as the 5ABP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section). P11
Fluorescence. Blue
Phosphorescence Blue
Persistence Short



5AUP24

5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

For use in Flying-Spot Color Video-Signal Generators

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 8 μ f

Cathode to all other electrodes 5 μ f

External conductive neck coating to ultor* { 500 max. μ f
100 min. μ f

Faceplate, Flat. Clear Glass

Phosphor, Metal-Backed (For Curves,
see front of this section) P24

Fluorescence Light Green

Phosphorescence Light Green

Persistence Extremely Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 40°

Overall Length 12-1/2" $\pm$ 3/8"

Greatest Diameter 5" $\pm$ 1/8"

Minimum Useful Screen Diameter 4-1/4"

Mounting Position Any

Weight (Approx.) 1.4 lbs

Cap. Recessed Small Cavity (JETEC No.J1-21)

Base Small-Shell Duodecal 7-Pin (JETEC No.B7-51)

BOTTOM VIEW

Pin 1-Heater

Pin 2-Grid No.1

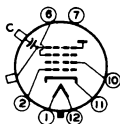
Pin 6-Grid No.3

Pin 7-Internal

Connection--

Do Not Use

Pin 10-Grid No.2



Pin 11-Cathode

Pin 12-Heater

Cap-Ultor

(Grid No.4,

Collector)

C-External

Conductive

Neck Coating

SOCKET CONTACTS CORRESPONDING TO VACANT

PIN POSITIONS 3, 4, 5, 8, AND 9 SHOULD

BE REMOVED

Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE 27000 max. volts

GRID-No.3 VOLTAGE 6000 max. volts

GRID-No.2 VOLTAGE 350 max. volts

* The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 5AUP24, the ultor function is performed by grid No.4. Since grid No.4 and collector are connected together within the 5AUP24, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

5AUP24



5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

GRID-No.1 VOLTAGE:

Negative bias value.	150 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. . . 410 max. volts

After equipment warm-up period 125 max. volts

Heater positive with respect to cathode. . 125 max. volts

Characteristics Range Values for Equipment Design:

For any ultor voltage (E_{c4}) between 20000* and 27000 volts

Grid-No.3 Voltage for Focus with Ultor Current of 200 μ amp. . .	17% to 21.5% of E_{c4}	volts
Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage (E_{c1}) for visual extinc- tion of undeflected focused spot	2 to 5 times E_{c1}	volts
Grid-No.1 Voltage for Visual Ex- tinction of Undeflected Focused Spot when circuit design utili- zes grid-No.2 voltage (E_{c2}) at fixed value.	-20% to -50% of E_{c2}	volts
Maximum Grid-No.3 Current for ultor current of 200 μ amp. . .	170	μ amp
Grid-No.2 Current.	-15 to +15	μ amp

Examples of Use of Design Ranges:

For ultor voltage of	27000	volts
Grid-No.3 Voltage for Focus with Ultor Current of 200 μ amp. . .	4600 to 5800	volts
Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage of -70 volts for visual extinction of undeflected fo- cused spot	140 to 350	volts
Grid-No.1 Voltage for Visual Ex- tinction of Undeflected Focused Spot when circuit design utili- zes grid-No.2 voltage of 200 volts.	-40 to -100	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 20000 volts.



5AUP24

5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

OPERATING CONSIDERATIONS

Resolution of better than 800 lines at the center of the reproduced picture can be produced by the 5AUP24 when it is operated with 27000 volts on the ultor. At lower ultor voltages, the resolution capability decreases. To obtain high resolution in the horizontal direction, it is necessary to use a video amplifier having a bandwidth of about 20 megacycles.

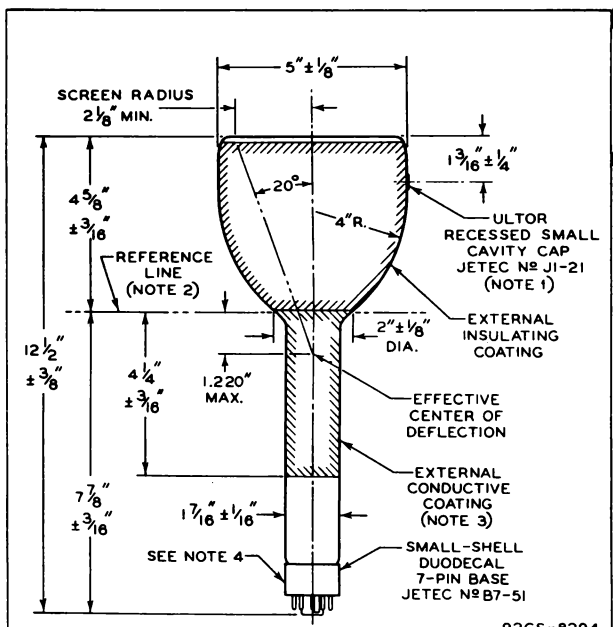
*For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section.*

5AUP24



5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTRON TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTRON TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY INTERSECTION OF PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

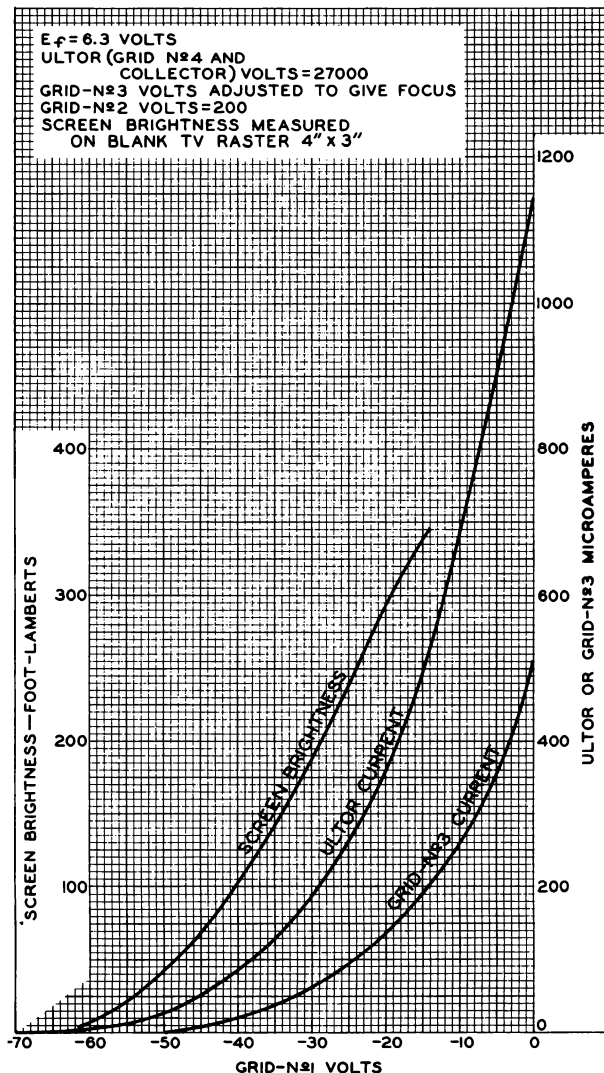
NOTE 4: $\angle$ OF BULB WILL NOT DEViate MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.



5AUP24

5AUP24

AVERAGE CHARACTERISTICS



JUNE. 21, 1954

TUBE DIVISION

92CM-8343

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5AYP4

VIEW-FINDER KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf

Cathode to all other electrodes. 5 μf

External conductive coating to ultor. $\begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Clear Glass

Phosphor (For curves, see front of this section). P4-Sulfide Type,
Metal-Backed

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angle (Approx.) 53°

Overall Length $11-9/16" \pm 3/8"$

Greatest Diameter of Bulb. $4-15/16" \pm 3/32"$

Minimum Useful Screen Diameter $4-1/4"$

Picture Size (within minimum-useful-screen area) $3-3/8" \times 2-1/2"$

Weight (Approx.) 1 lb 6 oz

Mounting Position. Any

Ultor[•] Terminal. Recessed Small Ball Cap (JETEC No.J1-22)

Bulb J-39-1/2

Base Long Medium-Shell Octal 8-Pin (JETEC No.B8-65)

BOTTOM VIEW

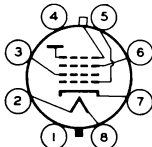
Pin 1 - No Connection

Pin 2 - Heater

Pin 3 - Grid No.2

Pin 4 - No Connection

Pin 5 - Grid No.1



Pin 6 - Grid No.3

Pin 7 - Cathode

Pin 8 - Heater

Cap - Ultor
(Grid No.4,
Collector)

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE[•] 10000 max. volts

GRID-No.3 VOLTAGE. 1500 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

[•] The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 5AYP4, the ultor function is performed by grid No.4. Since grid No.4 and collector are connected together within the 5AYP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

5AYP4



5AYP4

VIEW-FINDER KINESCOPE

GRID-No.1 VOLTAGE:

Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode.	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c4}) between 5000* and 10000 volts
and grid-No.2 voltage (E_{c2}) between 200 and 410 volts

Grid-No.3 Voltage for Focus
with Ultor Current of

100 μ amp	9.8% to 14.1% of E_{c4}	volts
-------------------------	---------------------------	-------

Grid-No.1 Voltage for Visual
Extinction of Focused

Raster	8.5% to 23.5% of E_{c2}	volts
------------------	---------------------------	-------

Max. Grid-No.3 Current** . .

See Curves

Grid-No.2 Current.

-15 to +15 μ amp

Field Strength of Adjustable

Centering Magnet	0 to 8	gausses
----------------------------	--------	---------

Examples of Use of Design Ranges:

For ultor voltage of	7000	10000	volts
and grid-No.2 voltage of	200	300	volts

Grid-No.3 Voltage for

Focus with Ultor

Current of 100 μ amp. . . .	680 to 990	980 to 1410	volts
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Grid-No.1 Voltage for

Visual Extinction of

Focused Raster	-17 to -47	-25 to -71	volts
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Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 5000 volts.

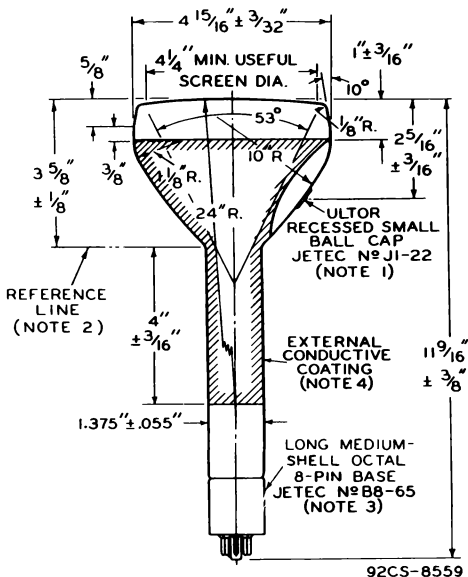
** Grid-No.3 current increases as the ultor voltage is decreased.



5AYP4

VIEW-FINDER KINESCOPE

5AYP4



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + 0.003" - 0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

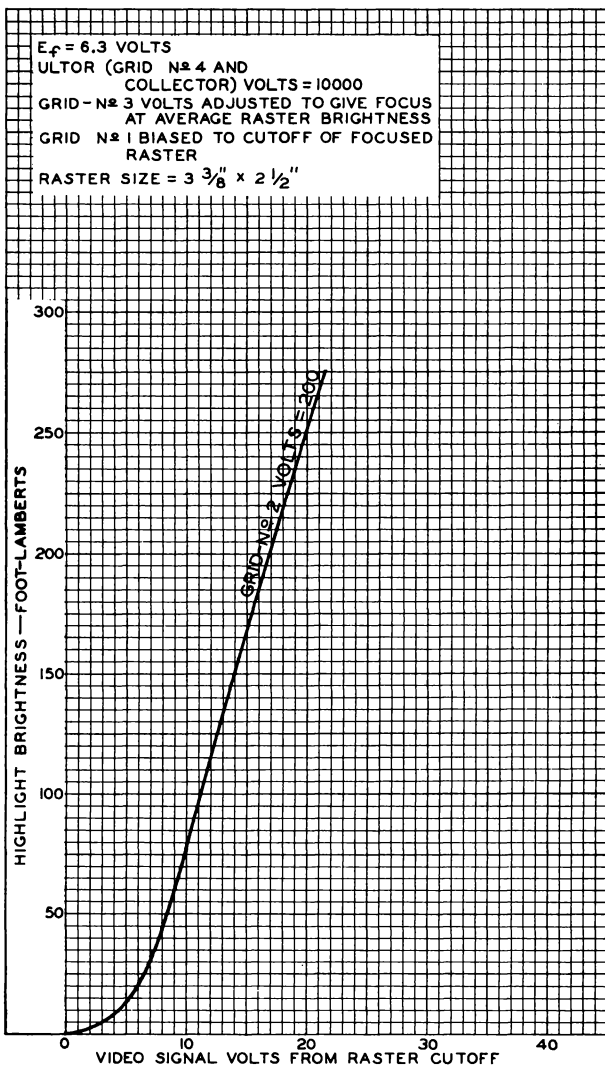
NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

5AYP4



5AYP4

AVERAGE GRID-DRIVE CHARACTERISTIC



FEB. 24, 1955

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92CM-8542

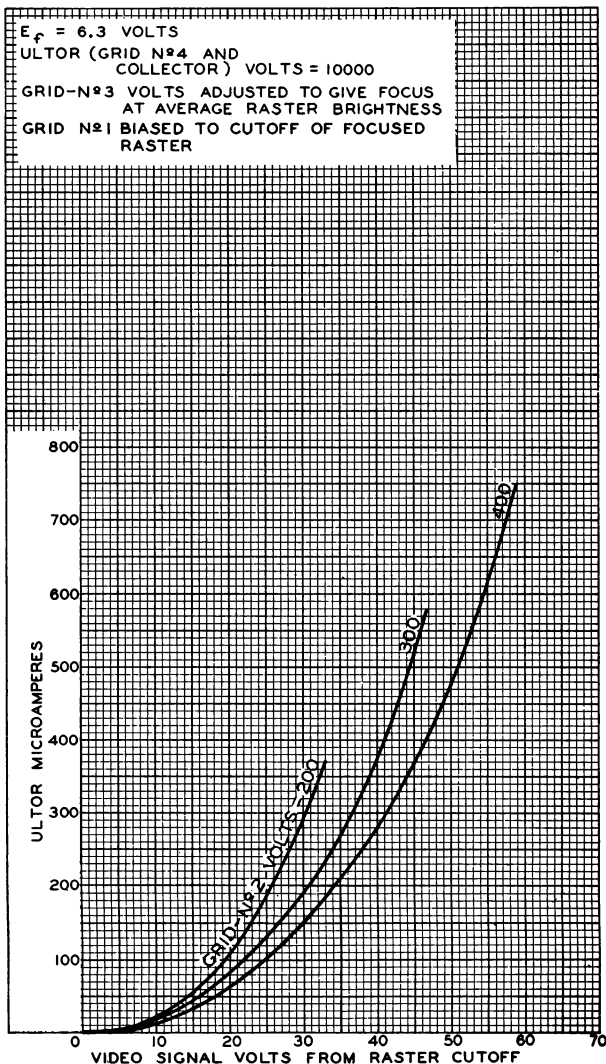
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5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 24, 1955

TUBE DIVISION

92CM-7688R2

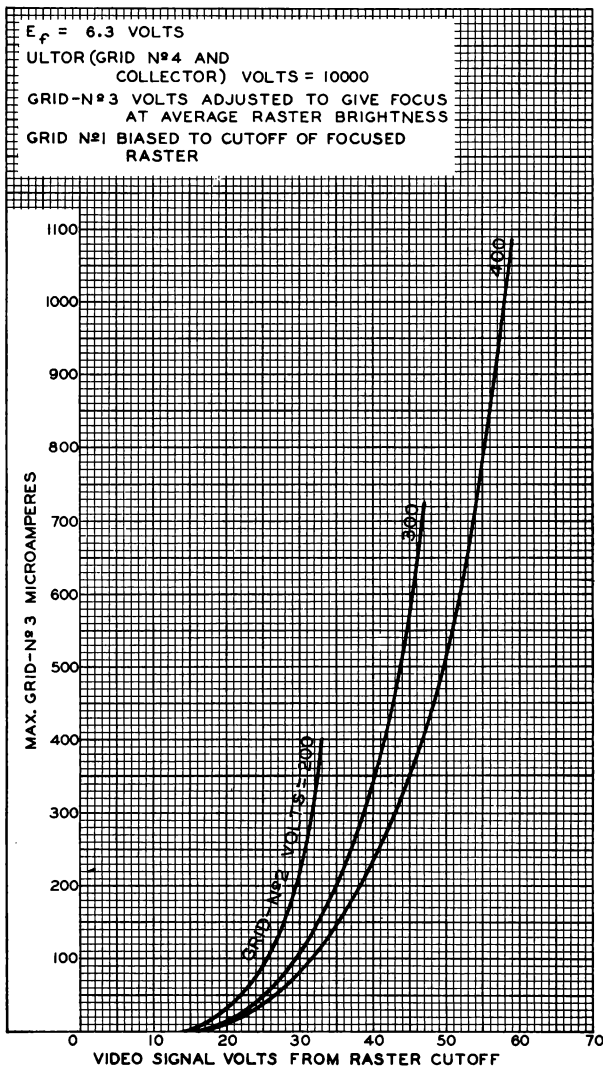
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5AYP4



5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 24, 1955

TUBE DIVISION

92CM - 7799R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5AZP4

5AZP4

PROJECTION KINESCOPE

ALUMINIZED FLUORESCENT SCREEN

FORCED-AIR COOLED AT MAXIMUM ULTOR INPUT

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 8 max. μf Cathode to all other electrodes 5 μf

Faceplate, Spherical Non-browning Glass

Refractive index 1.519

Phosphor (For curves, see front of this section). P4—Silicate Type

Aluminized

Fluorescence White

Phosphorescence White

Persistence Medium

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 50° Overall Length $12-3/16" \pm 3/8"$ Greatest Diameter of Bulb $5" \pm 1/8"$ Minimum Useful Screen Diameter $4-1/2"$ Minimum Optical-Quality-Circle Diameter $4-1/4"$ Weight (Approx.) $1-1/2$ lbs

Mounting Position Any

Ultror Lead Molded-On Insulated Cable 48" Long

Bulb J-40

Base Small-Shell Duodecal 7-Pin (JETEC No.B7-51)

Basing Designation for BOTTOM VIEW 12AA

Pin 1 — Heater

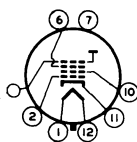
Pin 2 — Grid No.1

Pin 6 — Grid No.3

Pin 7 — Internal

Connection—
Do Not Use

Pin 10 — Grid No.2



Pin 11 — Cathode

Pin 12 — Heater

Flexible
Cable — Ultror
(Grid No.4,
Collector)

NOTE: Socket contacts for vacant pin positions 3,4,5,8,
and 9 should be removed so that maximum insulation
is provided for pins 6 and 7.

Air Flow to Face (When average ultror input exceeds 9 watts):

An adequate air flow sufficient to limit the faceplate
temperature to the specified value should be delivered
perpendicularly from a nozzle having a diameter of about
2 inches onto the face of the tube when it is in opera-
tion. The blower should have adequate capacity to pro-
vide for a total system pressure drop including that of
the air filter.

Face Temperature 100 max. $^\circ\text{C}$



5AZP4

PROJECTION KINESCOPE

Maximum Ratings, Absolute Values:

ULTOR VOLTAGE.	40000 max.	volts
ULTOR INPUT (AVERAGE):		
Without forced-air		
cooling of faceplate	9 max.	watts
With forced-air		
cooling of faceplate	12 max.	watts
GRID-No.3 VOLTAGE.	9000 max.	volts
GRID-No.2 VOLTAGE.	400 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	150 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	175 max.	volts
Heater positive with respect to cathode .	10 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c4}) between 35000 and 40000 volts*

Grid-No.3 (Focusing Electrode)		
Voltage for ultor current		
of 300 μ amp.	18.5% to 22.5% of E_{c4}	volts
Grid-No.2 Voltage when circuit design utilizes grid-No.1 voltage (E_{c1}) at fixed value for raster cutoff		
	2.15 to 5.4 times E_{c1}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2 voltage (E_{c2}) at fixed value		
	-18.5% to -46.5% of E_{c2}	volts
Maximum Grid-No.3 Current for ultor current of 300 μ amp		
	100	μ amp
Grid-No.2 Current.	-15 to +15	μ amp

Examples of Use of Design Ranges:

For ultor voltage of 36000 volts

Grid-No.3 (Focusing Electrode)		
Voltage for ultor current		
of 300 μ amp.	6650 to 8100	volts
Grid-No.2 Voltage when circuit design utilizes grid-No.1 voltage of -65 volts for raster cutoff.		
	140 to 350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2 voltage of 200 volts.		
	-37 to -93	volts

*: See next page.



5AZP4

5AZP4

PROJECTION KINESCOPE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 35000 volts.

OPERATING CONSIDERATIONS

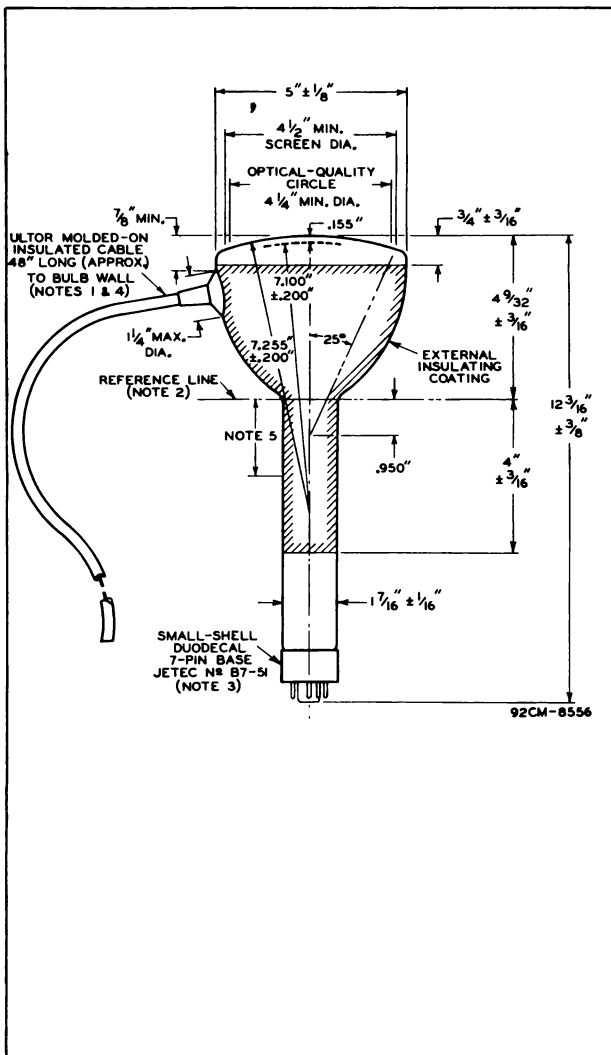
X-ray radiation is produced at the face of the 5AZP4 when it is operated at its normal ultor voltage. These rays can constitute a health hazard unless the tube is adequately shielded. For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section.

An *air-cooling system* is required to cool the face of the 5AZP4 when the tube is operated with an average ultor input in excess of 9 watts. The system consists of a suitable blower and air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. The air flow must be adequate to limit the faceplate temperature to 100°C. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the ultor power supply to prevent operation of the tube without cooling.



5AZP4

PROJECTION KINESCOPE





5AZP4

5AZP4

PROJECTION KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR-CABLE CONNECTION AT BULB WALL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 20^\circ$. ULTOR-CABLE CONNECTION IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.500" $\pm$ 0.003" - 0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS CORRESPONDING TO VACANT PIN POSITIONS No.3, 4, 5, 8, AND 9 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PINS No.6 AND 7.

NOTE 4: ULTOR CABLE SHOULD NOT BE SHARPLY BENT WITHIN 3" OF BULB WALL.

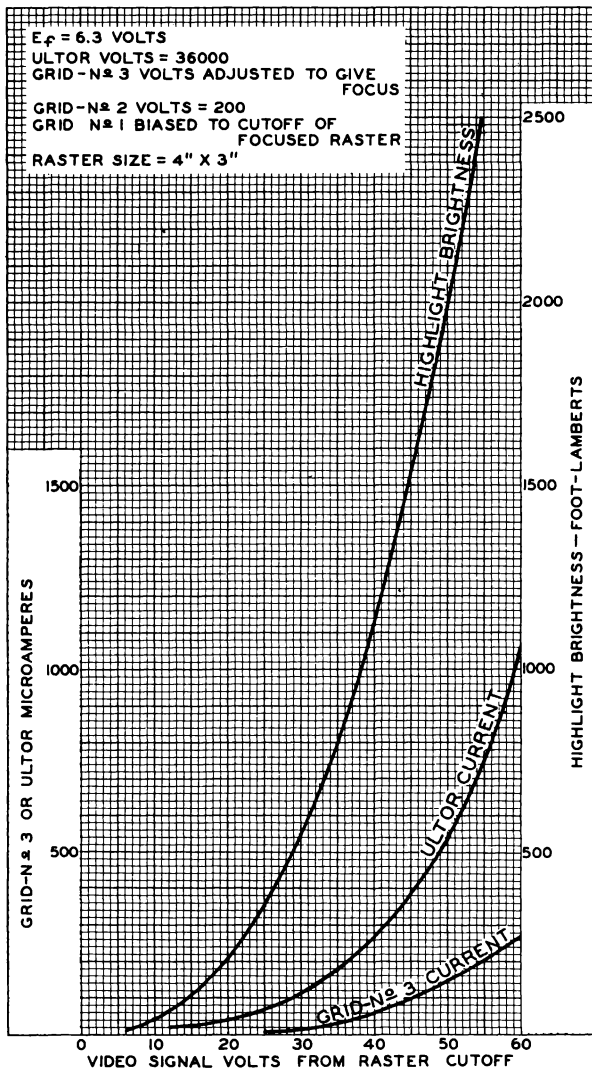
NOTE 5: THE WINDINGS OF THE DEFLECTING YOKE SHOULD NOT EXTEND MORE THAN 2" FROM THE REFERENCE LINE TOWARD THE BASE. THEY SHOULD BE INSULATED TO WITHSTAND 20 KV AND BE SPACED AT LEAST 1/10" FROM THE TUBE NECK.

5AZP4



5AZP4

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 8549



5BPI-A

5BPI-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 5BP1

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts

Current 0.6 amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 8.0 μf

DJ₁ to DJ₂ 1.3 μf

DJ₃ to DJ₄ 1.2 μf

DJ₁ to All Other Electrodes 9.5 μf

DJ₃ to All Other Electrodes 12.0 μf

DJ₁ to All Other Electrodes except DJ₂ 8.0 μf

DJ₂ to All Other Electrodes except DJ₁ 7.5 μf

DJ₃ to All Other Electrodes except DJ₄ 10.0 μf

DJ₄ to All Other Electrodes except DJ₃ 7.5 μf

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence Medium

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length $16\frac{3}{4}'' \pm \frac{3}{8}''$

Greatest Diameter of Bulb $5\frac{1}{4}'' + \frac{1}{16}''$

Minimum Useful Screen Diameter $4\frac{1}{2}''$

Mounting Position Any

Base Medium Shell Magnal 11-Pin

Basing Designation for BOTTOM VIEW 11N

Pin 1-Heater

Pin 2-No Connection

Pin 3-Deflecting

Electrode DJ₁

Pin 4-Anode No.1

Pin 5-Internal Con.

Do not use

Pin 6-Deflecting

Electrode DJ₄

Pin 7-Anode No.2,

Grid No.2

Pin 8-Deflecting

Electr. DJ₂

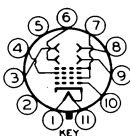
Pin 9-Deflecting

Electr. DJ₃

Pin 10-Grid No.1

Pin 11-Heater,

Cathode



DJ₁ and DJ₂ are nearer the screen

DJ₃ and DJ₄ are nearer the base

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 4. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° ± 3°.

5BP1-A



5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Maximum Ratings, Absolute Values:

ANODE-No.2 & GRID-No.2 VOLTAGE.	2200 <i>max.</i>	volts
ANODE-No.1 VOLTAGE.	1100 <i>max.</i>	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value.	125 <i>max.</i>	volts
Positive Value.	0 <i>max.</i>	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	550 <i>max.</i>	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage*	1500	2000	. . .	volts
Anode-No.1 Volt. for Focus at 75%				
of Grid-No.1 Volt. for Cutoff*	337	450	. . .	volts
Grid-No.1 Volt. for Visual Cutoff#.	-30	-40	. . .	volts
Max. Anode-No.1 Current Range^.	Between -50 and +10 μ amp.			
Deflection Sensitivity:				
DJ ₁ and DJ ₂	0.404	0.303	. . .	mm/v dc
DJ ₃ and DJ ₄	0.446	0.334	. . .	mm/v dc
Deflection Factor:**				
DJ ₁ and DJ ₂	63	84	. . .	v dc/in.
DJ ₃ and DJ ₄	57	76	. . .	v dc/in.

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.

● Individual tubes may require between +25% and -30% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to $\pm 50\%$ of these values.

▲ See curve for average values.

** Individual tubes may vary from these values by $\pm 17\%$.

Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ₁ and DJ₂. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each, connected to anode-No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

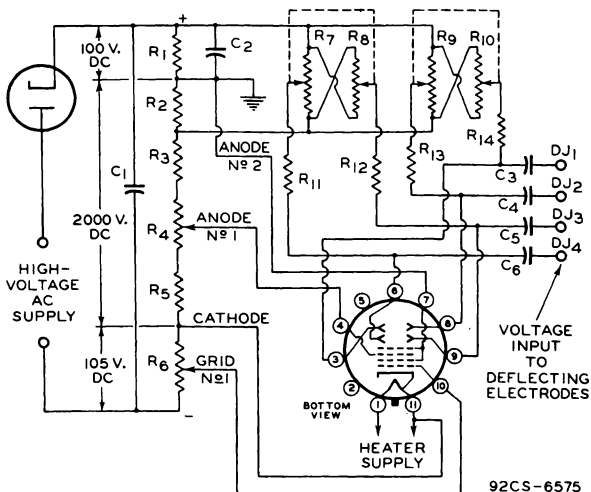
Grid-No.1—Circuit Resistance	1.5 <i>max.</i>	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 <i>max.</i>	megohm
Resistance in Any Deflecting- Electrode Circuit ^{▲▲}	5.0 <i>max.</i>	megohms

▲▲ It is recommended that all deflecting-electrode-circuit resistances be approximately equal.



SBPI-A

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μ f
C2: 1.0 μ f
C3 C4 C5 C6: 0.05- μ f Blocking
Capacitors*
R1 R2: 2 Megohms
R3: 6 Megohms

R4: 2-Megohm Potentiometer
R5: 1.0 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms

* When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

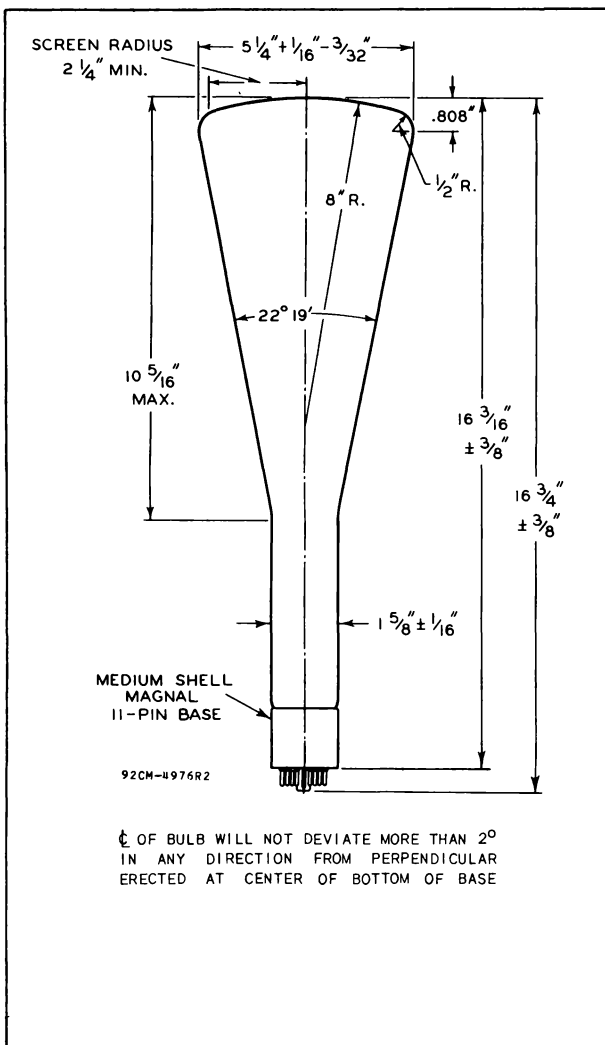
The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

5BPI-A



5BPI-A

HIGH-VACUUM CATHODE-RAY TUBE



JULY 1, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 2



5BPI-A

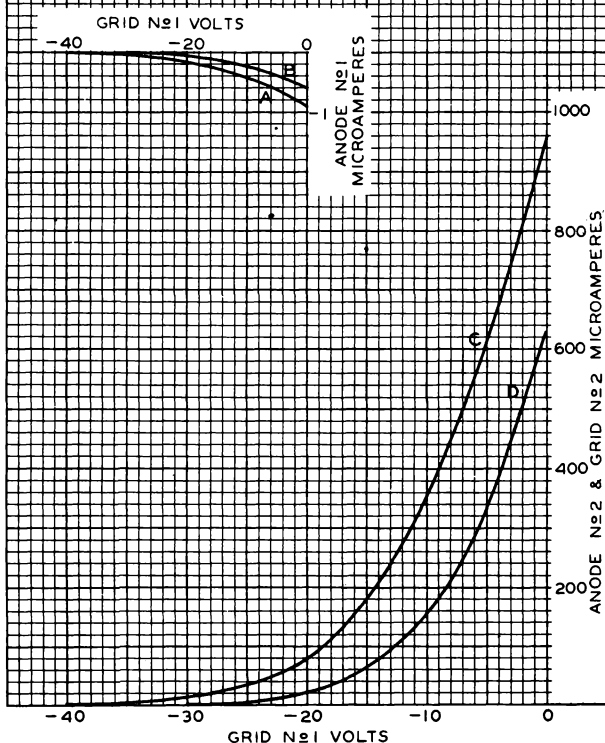
5BPI-A

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

ANODE N°1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE N°2 & GRID N°2 VOLTS
A	ANODE N°1	2000
B	ANODE N°1	1500
C	ANODE N°2 & GRID N°2	2000
D	ANODE N°2 & GRID N°2	1500



FEB. 7, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4984R3



5CPI-A

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

5CPI-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8 μf Cathode to All Other Electrodes. 9 μf DJ₁ to DJ₂ 2 μf DJ₃ to DJ₄ 2 μf DJ₁ to All Other Electrodes. 9 μf DJ₂ to All Other Electrodes. 9 μf DJ₃ to All Other Electrodes. 7 μf DJ₄ to All Other Electrodes. 8 μf

Phosphor (For Curves, see front of this Section) P1

Fluorescence and Phosphorescence Green

Persistence of Phosphorescence Medium

Focusing Method. Electrostatic

Deflection Method Electrostatic

Overall Length 16-3/4" $\pm$ 3/8"Greatest Diameter of Bulb 5-1/4" $\pm$ 3/32"

Minimum Useful Screen Diameter 4-1/2"

Mounting Position. Any

Cap. Recessed Small Ball (JETEC No.J1-22)

Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)

Basing Designation for BOTTOM VIEW 14J1

Pin 1-Heater Pin 9-Anode No.2,

Pin 2-Cathode Grid No.2

Pin 3-Grid No.1 Pin 10-Deflecting

Pin 4-Internal Con. Electr.DJ₂

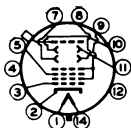
Do not use Pin 11-Deflecting

Pin 5-Anode No.1 Electr.DJ₁

Pin 7-Deflecting Pin 12-No Con-

Electrode DJ₃ section

Pin 8-Deflecting Pin 14-Heater

Electrode DJ₄ Cap -Anode No.3*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by DJ₁ and DJ₂ by the following angular tolerances measured about the tube axis: Pin 5, 10°; Cap (on same side of tube as pin 5), 10°.

The angle between the trace produced by DJ₁ and DJ₂ and the trace produced by DJ₃ and DJ₄ is 90° $\pm$ 3°.

5CPI-A



5CPI-A OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ANODE-No.3 VOLTAGE	4000 max.	volts
ANODE-No.2* VOLTAGE.	2000 max.	volts
RATIO OF ANODE-No.3 VOLTAGE TO ANODE-No.2 VOLTAGE		
	2.3 : 1	
ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value*	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE		
	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.3 voltage (E_{b3}) between 2000** and 4000 volts
and any anode-No.2 voltage (E_{b2}) between 1500^Δ and 2000 volts

→ Anode-No.1 Voltage	18.7 to 34.5% of E_{b2}	volts
→ Grid-No.1 Voltage ^Δ	1.5% to 4.5% of E_{b2}	volts
Anode-No.1 Current of any Operating Condition	-15 to +10	μamp

Deflection Factors:

When $E_{b3} = 2 \times E_{b2}$

DJ1 & DJ2	39 to 53 v dc/in./kv of E_{b2}
DJ3 & DJ4	33 to 45 v dc/in./kv of E_{b2}

When $E_{b3} = E_{b2}$

DJ1 & DJ2	31 to 42 v dc/in./kv of E_{b2}
DJ3 & DJ4	27 to 37 v dc/in./kv of E_{b2}

Spot Position. ##

Examples of Use of Design Ranges:

For anode-No.3				
voltage of.	2000	3000	4000	volts
and anode-No.2				
voltage of.	2000	1500	2000	volts

→ Anode-No.1 Volt.	375 to 690	280 to 515	375 to 690 volts
→ Grid-No.1 Volt. ^Δ	-30 to -90	-22.5 to -67.5	-30 to -90 volts

Deflection Factors:

DJ1 & DJ2	62 to 84	59 to 80	78 to 106	□
DJ3 & DJ4	54 to 74	50 to 68	66 to 90	□

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any		
Deflecting-Electrode Circuit [■]	5.0 max.	megohms

*, •, **, Δ, ◊, ##, ■, □: See next page.

→ Indicates a change.

OCTOBER 1, 1951

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1



5CPI-A

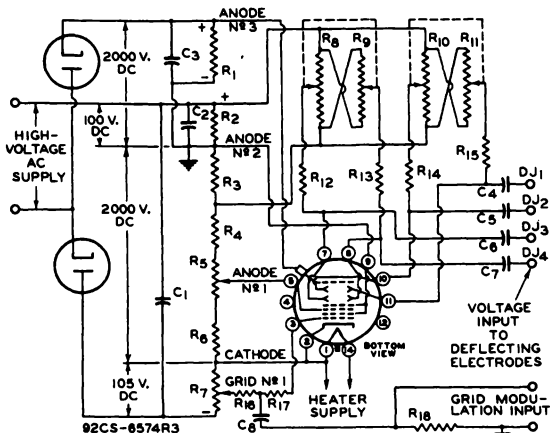
5CPI-A OSCILLOGRAPH TUBE

- * Anode No.2 and grid No.2, which are connected together within tube, are referred to herein as anode No.2.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode-No.2 input power to 6 watts.
- ** It is recommended that anode-No.3 voltage be not less than 3000 volts for high-speed scanning.
- ▲ Recommended minimum value of anode-No.2 voltage.
- ♣ For visual cutoff of undeflected focused spot.
- Volts dc/in.
- ## With heater voltage of 6.3 volts, anode-No.3 voltage of 4000 volts, anode-No.2 voltage of 2000 volts, anode-No.1 voltage adjusted to focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and tube shielded from all extraneous fields, the center of the undeflected, focused spot will fall within a circle having a 12.5-mm radius concentric with the center of the tube face.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



5CPI-A
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



- C1: 0.1 μ f, 2500 Volts
C2: 1.0 μ f, 200 Volts
C3: 0.1 μ f, 2500 Volts
C4 C5 C6 C7: 0.05- μ f,
Blocking Capacitors★
C8: 0.0001 μ f, 2500 Volts
R1: 50 Megohms (Five 10-Meg-
ohm, 1-Watt Resistors
in Series)
R2 R3: 2 Megohms, 0.5 Watt
R4: 5.5 Megohms, 2 Watts

- R5: 2-Megohm Potentiometer
R6: 1.5 Megohms, 0.5 Watt
R7: 0.5-Megohm Potentiometer
R8 R9: Dual 5-Megohm Potentiometer
R10 R11: Dual 5-Megohm Potentiometer
R12 R13 R14 R15: 2 Megohms, 0.5 Watt
R16: 0.5 Megohm, 0.5 Watt
R17: Not less than 2000 ohms per
voltage of positive signal
R18: 5 Megohms, 0.5 watt

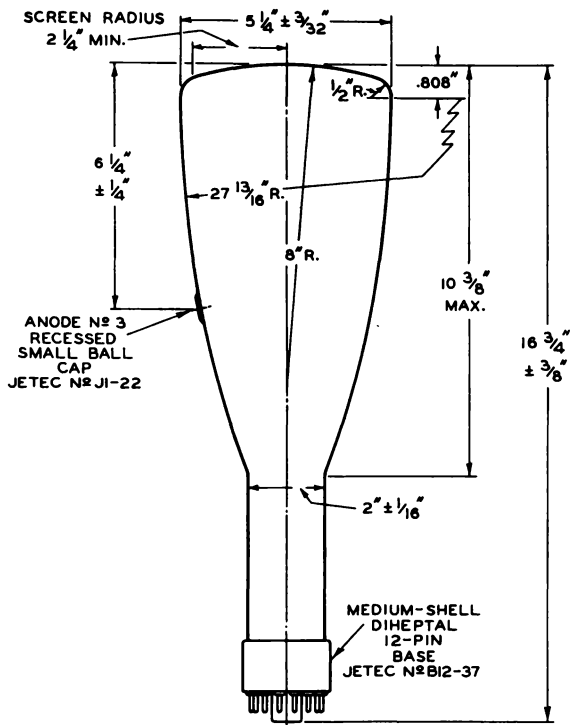
★ When cathode is grounded, capacitors should have high voltage rating (2500 volts); when anode No.2 is grounded, they may have low voltage rating (200 volts). For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



5CPI-A

5CPI-A OSCILLOGRAPH TUBE



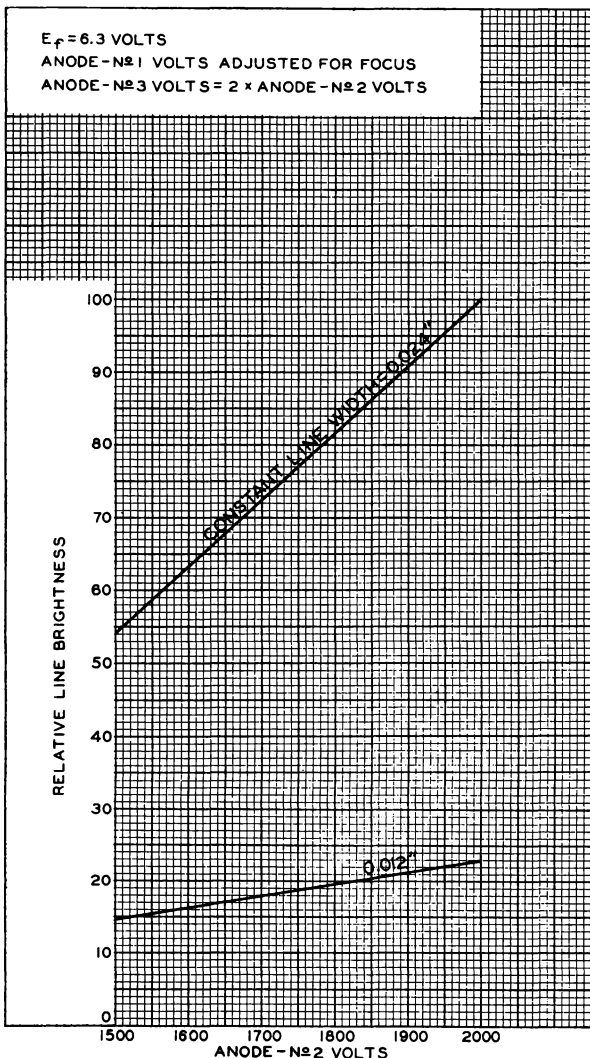
☐ OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM PERPENDICULAR
ERECTED AT CENTER OF BOTTOM OF BASE

92CM-6408R4

5CPI-A



5CPI-A CHARACTERISTICS



DEC. 23, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

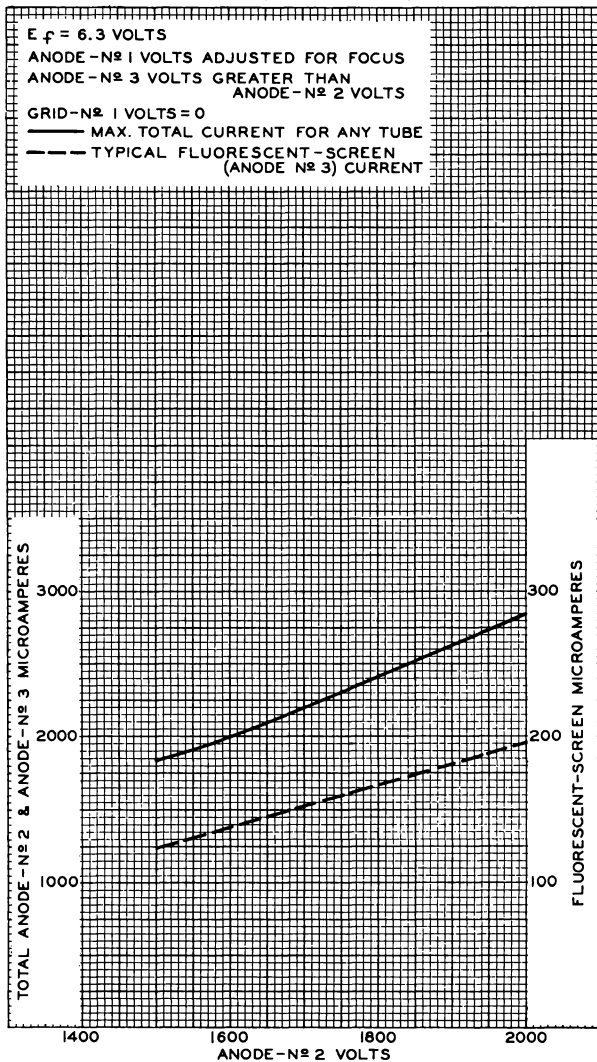
92CM-6820



5CPI-A

5CPI-A

CHARACTERISTICS



5CPI-A



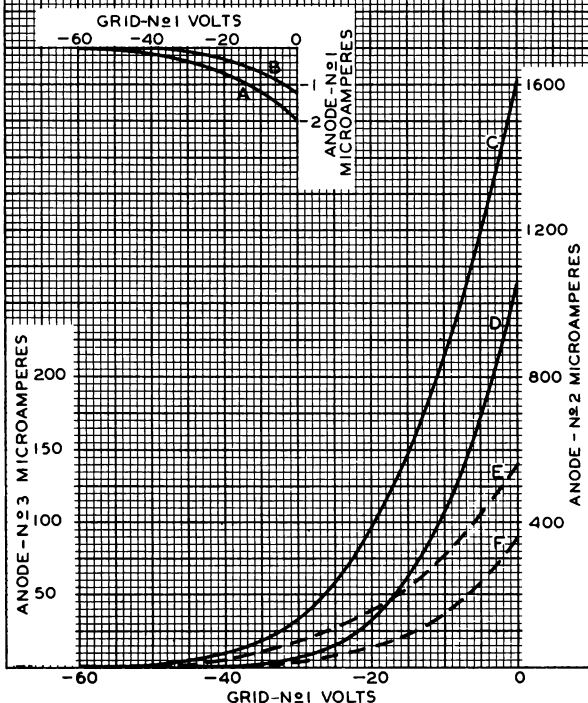
5CPI-A

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

ANODE-Nº1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE-Nº2 VOLTS	ANODE-Nº3 VOLTS
A	ANODE Nº 1	2000	2000-4000
B	ANODE Nº 1	1500	1500-3000
C	ANODE Nº 2	2000	4000
D	ANODE Nº 2	1500	3000
E	ANODE Nº 3	2000	4000
F	ANODE Nº 3	1500	3000



DEC. 26, 1946

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6414 R2



5CP7-A

5CP7-A OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 5CP7-A is the same as the 5CP1-A, except that it has a screen of the greenish-yellow, long-persistence type, designated P7.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC, as well as PERSISTENCE CURVES of BUILDUP and DECAY for the P7 PHOSPHOR are shown at the beginning of this Section.



5CP11-A OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

5CP11-A

The 5CP11-A is the same as the 5CP1-A, except that it has a screen of the short-persistence, blue-fluorescence type designated P11. Its highly actinic fluorescent spot of unusually high brightness makes the 5CP11-A particularly useful for photographic recording. Because its improved phosphor has exceptional brightness for a blue screen, the 5CP11-A is also quite useful for visual observation of phenomena.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC,
as well as the PERSISTENCE CHARACTERISTIC
for the P11 PHOSPHOR are shown at the
beginning of this Section.



5CP12

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

5CP12

The 5CP12 is the same as the 5CP1-A except that it utilizes a medium-long-persistence screen which exhibits orange fluorescence and phosphorescence.

Because of its medium-long persistence, the 5CP12 is particularly useful where low- and medium-speed recurring phenomena are to be observed. However, it may also be used for observing low- and medium-speed, non-recurring phenomena but its efficiency is low. The persistence is such that the 5CP12 can be operated with scanning frequencies as low as 10 cycles per second without excessive flicker.

It will be noted that the phosphorescence decays exponentially with a time constant of about 120 milliseconds with the result that the low-level phosphorescence is of relatively short duration. Because of this characteristic, the 5CP12 provides high contrast between new and old information with change in target position. Therefore, the 5CP12 is suitable for short-range radar equipment involving medium-speed recurrent phenomena.

The P12 screen is more susceptible to burning than other phosphors. Therefore, the 5CP12 should be operated with the rated maximum anode-No.3 voltage and with the lowest anode-No.3 current which will give the desired brightness.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC
and the PERSISTENCE CHARACTERISTIC of
the P12 Phosphor are shown at the
front of this Section.



5FP4-A

KINESCOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 $\pm$ 10% ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.5 . . μ fCathode to All Other Electrodes. 5.0 . . μ f

Phosphor (For Curves see front of this section). No.4

Fluorescence White

Persistence. Medium

Focusing Method. Magnetic

Deflection Method Magnetic

Solid Deflection Angle (Approx.) 53°

Overall Length 11-1/8" $\pm$ 3/8"Greatest Diameter of Bulb. 4-15/16" $\pm$ 3/32"

Minimum Useful Screen Diameter 4-1/4"

Raster Size (Approx.) 3" x 4"

Mounting Position. Any

Cap. Recessed Small Ball

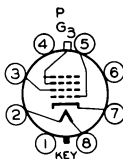
Base Long Medium-Shell Octal 8-Pin

BOTTOM VIEW

Pin 1—No
Connection

Pin 2—Heater

Pin 3—Grid No.2

Pin 4—No
Connection

Pin 5—Grid No.1

Pin 6—No
Connection

Pin 7—Cathode

Pin 8—Heater
Cap—Anode,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE & GRID-No.3 VOLTAGE. 8000 max. volts

GRID-No.2 VOLTAGE. 300 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation:

Anode & Grid-No.3 Voltage* 6000 . . volts

Grid-No.2 Voltage. 250 . . volts

Grid-No.1 Voltage^o -45 . . voltsFocusing-Coil Current (DC)[▲] 122 approx. ma.Horizontal Deflecting Coil Current (DC)[□] . 340 approx. ma.*, ^o, [▲], [□]: See next page.

5FP4-A



5FP4-A KINESCOPE

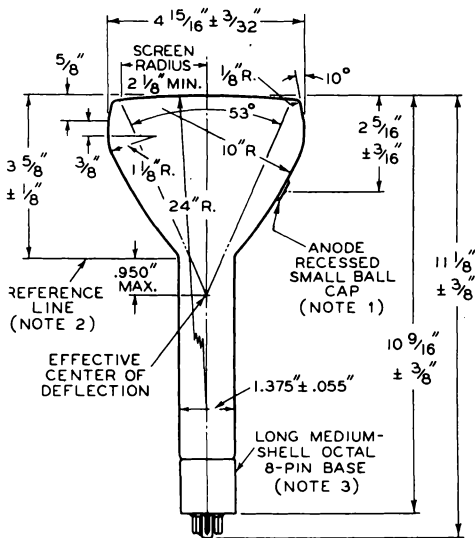
Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

- * Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.
- Visual extinction of undeflected focused spot. Supply should be adjustable to + 55% and - 45% of indicated value.
- ▲ For RCA Focusing Coil, Stock No.52446, or equivalent, with the combined grid-No.1-bias voltage and video-signal voltage adjusted to produce a highlight brightness of 10 foot-lamberts on a 2-7/8" x 3-7/8" picture area.
- To deflect beam from side to side of a raster 3-7/8" wide with RCA Deflection Yoke, Stock No.51586, or equivalent. Coil current varies directly as the square root of the anode voltage.



5FP4-A



NOTE 3: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

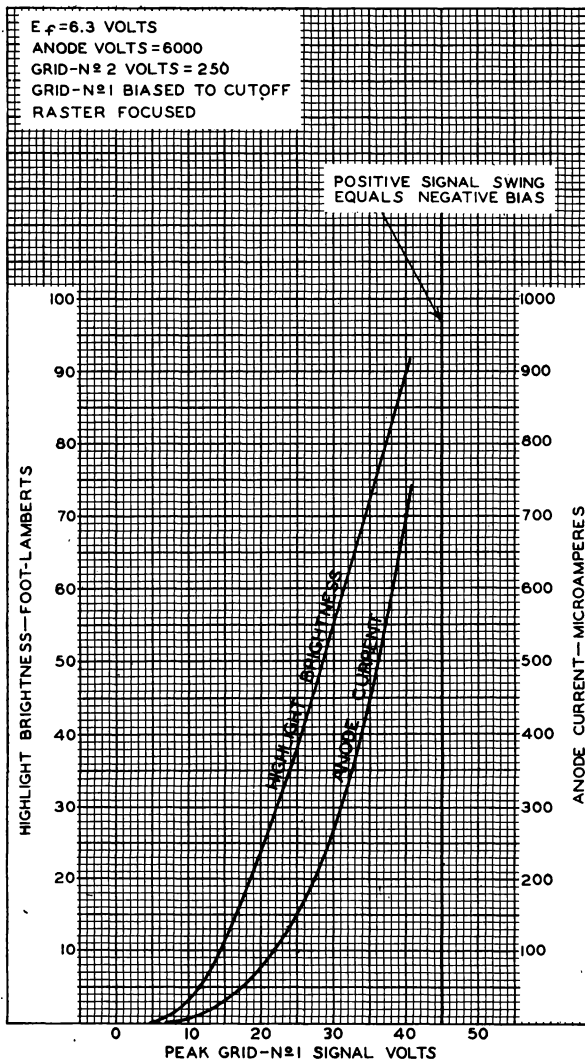
92CM-6362R3

5FP4-A



5FP4-A

AVERAGE CHARACTERISTICS



FEB. 26, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6683



5FP7-A

5FP7-A

OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA**General:**

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.5 μ fGrid No.2 to All Other Electrodes. 7 μ fCathode to All Other Electrodes. 5 μ f

Phosphor (For Curves, see front of this Section) No.7

Fluorescence Blue

Phosphorescence. Greenish-Yellow

Persistence of Phosphorescence Long

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 53°

Overall Length 11-1/8" $\pm$ 3/8"Greatest Diameter of Bulb. 4-15/16" $\pm$ 3/32"

Minimum Useful Screen Diameter 4-1/4"

Mounting Position. Any

Cap. Recessed Small Ball

Base Long Medium-Shell Octal 8-Pin

BOTTOM VIEW

Pin 1--No

Connection

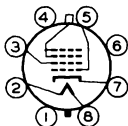
Pin 2--Heater

Pin 3--Grid No.2

Pin 4--No

Connection

Pin 5--Grid No.1



Pin 6--No

Connection

Pin 7--Cathode

Pin 8--Heater

Cap -- Anode,
Grid No.3**Maximum Ratings, Design-Center Values:**ANODE[●] VOLTAGE 8000 max. volts

GRID-No.2 VOLTAGE. 700 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value[□]. 0 max. volts

Positive peak value. 2 max. volts

PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation:

Anode Voltage* 4000 7000 volts

Grid-No.2 Voltage. 250 250 volts

Grid-No.1 Voltage Range[○] . . . -25 to -70 -25 to -70 voltsFocusing-Coil Current[▲] . . . 75 to 102 99 to 135 ma

Spot Position. # -

●, □, *, ○, ▲, #: See next page.

JUNE 15, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5FP7-A



5FP7-A OSCILLOGRAPH TUBE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance 150 min. ohms

Grid-No.2-Circuit Resistance 820 min. ohms

Anode-Circuit Resistance 9100 min. ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

RCA Focusing Coil. RCA Type No. 202D1

- Anode and grid No. 3, which are connected together within tube, are referred to herein as anode.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
- * Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.
- For visual extinction of undeflected focused spot.
- ▲ For JETEC Focusing Coil No. 106, or equivalent, with center line of air gap approximately 2-3/4" from reference line (see Outline Drawing), and total anode current of 200 microamperes.
- * The center of the undeflected, unfocused spot will fall within a circle having 9 mm radius concentric with the center of the tube face.

OUTLINE DIMENSIONS for Type 5FP7-A
are the same as those for Type 5FP4-A

AVERAGE CHARACTERISTIC CURVE
for Type 5FP7-A is the same as that shown for
Type 7BP7-A

JUNE 15, 1948

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5FP15-A

5FP15-A OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes 8 $\mu\mu\text{f}$ Cathode to all other electrodes 5 $\mu\mu\text{f}$

Faceplate, Spherical. Clear Glass

Phosphor (For Curves, see front of this Section). P15

Fluorescence--

Visible radiation Blue-Green

Invisible radiation Near-Ultraviolet

Phosphorescence--

Persistence of visible radiation. Very Short

Persistence of invisible radiation. Extremely Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.). 53°

Tube Dimensions:

Overall length. $11\text{--}1\frac{1}{8}" \pm \frac{3}{8}"$ Greatest diameter of bulb $4\text{--}15\frac{16}" \pm \frac{3}{32}"$ Minimum Useful Screen Diameter. $4\text{--}1\frac{1}{4}"$

Weight (Approx.). 1 lb 2 oz

Mounting Position Any

Cap Recessed Small Ball (JETEC No. J1-22)

Bulb. J-39-1/2

Base. Medium-Shell Octal 8-Pin (JETEC No. B8-11)

Basing Designation for BOTTOM VIEW. 5AN

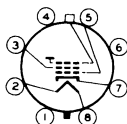
Pin 1 - No Connec-
tion

Pin 2 - Heater

Pin 3 - Grid No.2

Pin 4 - No Connec-
tion

Pin 5 - Grid No.1

Pin 6 - No Connec-
tion

Pin 7 - Cathode

Pin 8 - Heater

Cap - Ultor
(Grid No.3,
Collector)

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE 8000 max. volts

GRID-No.2 VOLTAGE 700 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 180 max. volts

Positive bias value* 0 max. volts

Positive peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode 125 max. volts

Heater positive with respect to cathode 125 max. volts

* At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.

5FPI5-A



5FPI5-A

OSCILLOGRAPH TUBE

Equipment Design Ranges:

For any ultor voltage (E_{c3}) between 4000* and 8000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 700 volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot -10% to -28% of E_{c2} voltsGrid-No.2 Current -15 to +15 μ ampFocusing-Coil Current (DC)^{OO}. $\left[\sqrt{E_{c3}/4000} \times 96 \right] \pm 15\%$ ma

Spot Position ##

Examples of Use of Design Ranges:

For ultor voltage of	4000	5000	volts
and grid-No.2 voltage of	250	250	volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot -25 to -70 -25 to -70 volts

Focusing-Coil Current (DC). 82 to 110 91 to 123 ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

SPECIAL PERFORMANCE DATA

Line Width:

For Ultor Voltage of 4000 Volts 0.010 max.▲ inch

For Ultor Voltage of 5000 Volts 0.009 max.▲ inch

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 4000 volts.

OO For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line (See Dimensional Outline) and ultor current of 200 microamperes.

With the tube shielded from extraneous fields, the center of the undelected, unfocused, low-intensity spot will fall within a circle having a 9-mm radius concentric with the center of the tube face.

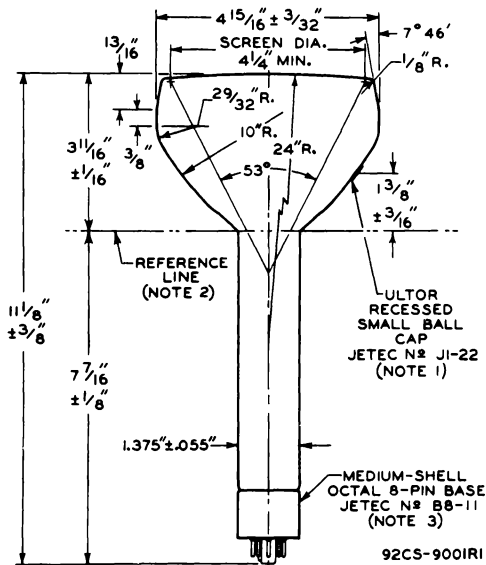
▲ With JETEC Deflecting Yoke No.120, or equivalent, and under the following conditions: heater voltage of 6.3 volts, ultor current of 200 microamperes, grid-No.2 voltage of 250 volts, and a 49-line raster. Raster width is adjusted to 11.4 cm and focusing-coil current is adjusted to give sharpest focus at center of tube face. Raster height is contracted until individual scanning lines are just barely distinguishable. Line width is expressed as the quotient of the contracted raster height measured at the centerline of the tube face divided by the number of scanning lines (49).



5FPI5-A

OSCILLOGRAPH TUBE

5FPI5-A



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE $1.430" + .003" - .000"$ I.D. AND 2" LONG WILL REST ON BULB CONE.

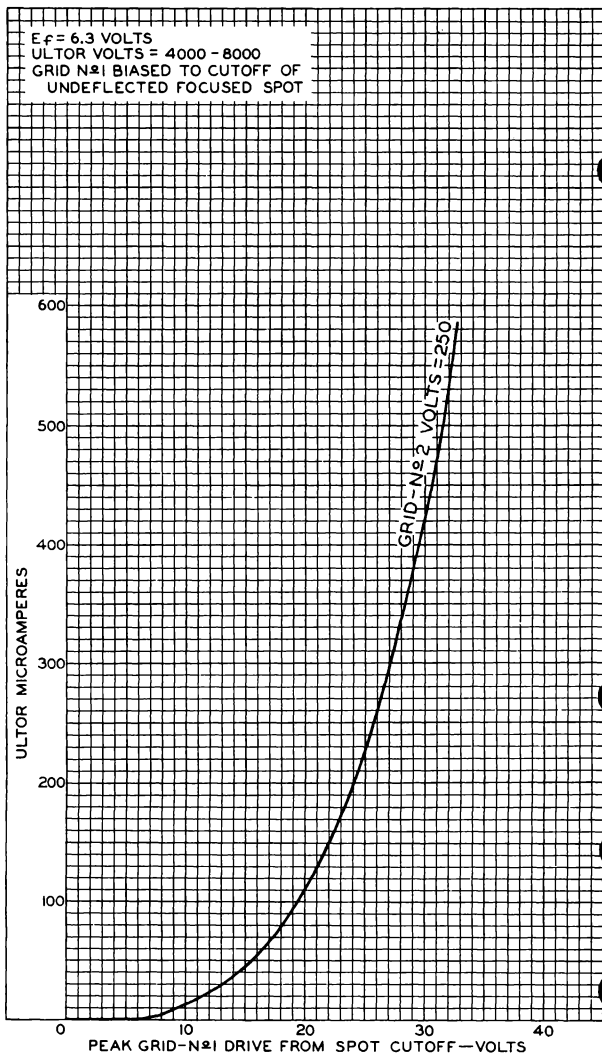
NOTE 3: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5FP15-A



5FP15-A

AVERAGE GRID-DRIVE CHARACTERISTIC



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9002



5TP4

PROJECTION KINESCOPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

5TP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 7.5 μf Cathode to All Other Electrodes. 5.0 μf External Conductive Coating to Anode No.2 { 500 max. μf
100 min. μf

Phosphor (For Curves, see front of this Section) No.4

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angle (Approx.) 50° Overall Length $11\text{--}3/4" \pm 3/8"$ Greatest Diameter of Bulb. $5" \pm 1/8"$ Minimum Useful Screen Diameter $4\text{--}1/2"$ Minimum Optical-Quality-Circle Diameter. $4\text{--}1/4"$

Mounting Position. Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 7-Pin

Basing Designation for BOTTOM VIEW 12C

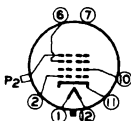
Pin 1-Heater

Pin 2-Grid No.1

Pin 6-Anode No.1

Pin 7-Internal Con.-

Do Not Use



Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater

Cap - Anode No.2

Maximum Ratings, Design-Center Values:

ANODE-No.2 VOLTAGE 27000 max. volts

ANODE-No.1 VOLTAGE 6000 max. volts

GRID-No.2 VOLTAGE. 350 max. volts

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative bias value. 150 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 175 max. volts

Heater positive with respect to cathode 10 max. volts

Typical Operation:

Anode-No.2 Voltage* 27000 . . . volts

Anode-No.1 Voltage for Focus

when anode-No.2 current is 200 μa 4320 to 5400 volts

* See next page.

← Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

5TP4



5TP4

PROJECTION KINESCOPE

Grid-No.2 Voltage**	200 . .	volts
→ Grid-No.1 Voltage for Visual Cutoff ^o . .	-42 to -98	volts
Anode-No.2 Current	200 . .	μa
→ Max. Anode-No.1 Current	65 . .	μa
Max. Grid-No.2 Current	±15 . .	μa

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

→ **Minimum Circuit Values:**

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	180 min.	ohms
Grid-No.2-Circuit Resistance	390 min.	ohms
Anode-No.1-Circuit Resistance	6800 min.	ohms
Anode-No.2-Circuit Resistance	30000 min.	ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

Deflection Yoke.	RCA Type No.201D2
Horizontal Output Transformer (for use with two 6BG6-G's). . .	RCA Type No.211T2
Vertical Output Transformer.	RCA Type No.204T2

* Brilliance and definition decrease with decreasing anode voltages. In general, anode No.2 voltage should not be less than 20000 volts.

** Subject to variation of ±40% if it is desired to operate any tube at a grid-No.1 cutoff bias of -70 volts.

o Visual extinction of undeflected focused spot.

→ Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT

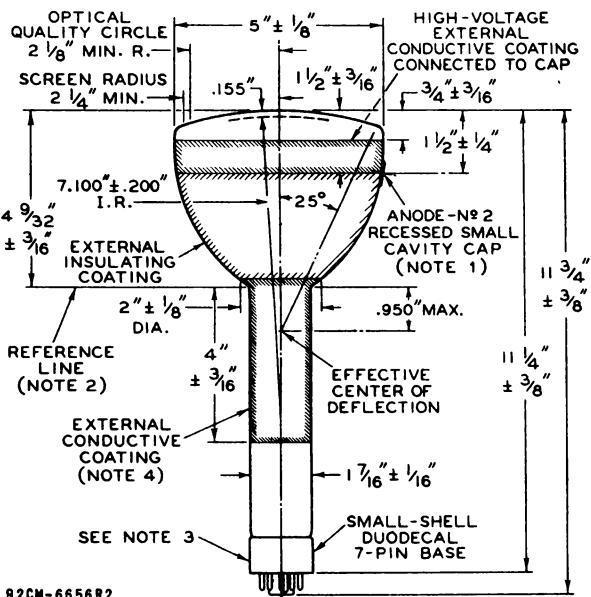
DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5TP4 PROJECTION KINESCOPE

5TP4



92CM-6656R2

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE-No. 2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE-No. 2 TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY.

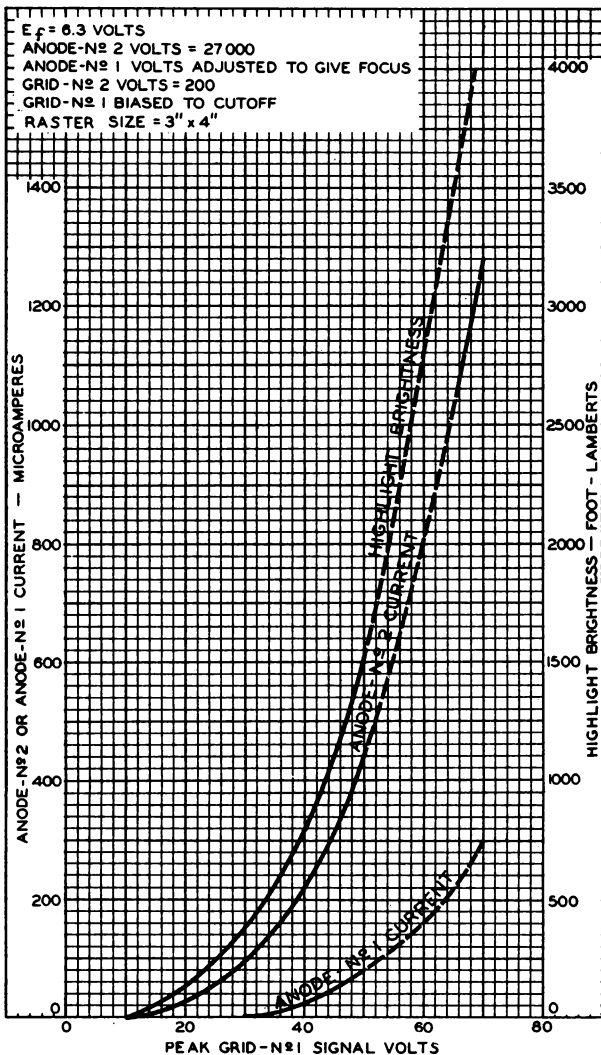
NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

5TP4



5TP4

AVERAGE CHARACTERISTICS



FEB. 7, 1946

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6670



SUPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

SUPI

General:

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts
Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.0 . . . $\mu\mu\text{f}$
DJ1 to DJ2 2.5 . . . $\mu\mu\text{f}$
DJ3 to DJ4 2.5 . . . $\mu\mu\text{f}$
DJ1 to All Other Electrodes. 11.0 . . . $\mu\mu\text{f}$
DJ2 to All Other Electrodes. 8.0 . . . $\mu\mu\text{f}$
DJ3 to All Other Electrodes. 7.0 . . . $\mu\mu\text{f}$
DJ4 to All Other Electrodes. 8.0 . . . $\mu\mu\text{f}$

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence. Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Overall Length $14\text{--}3/4" \pm 3/8"$

Greatest Diameter of Bulb. $5\text{--}1/4" \pm 3/32"$

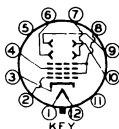
Minimum Useful Screen Diameter $4\text{--}1/2"$

Mounting Position. Any

Base Small-Shell Duodecal 12-Pin

Basing Designation for BOTTOM VIEW 12E

Pin 1-Heater	Pin 8-Anode No.2, Grid No.2
Pin 2-Grid No.1	Pin 9-Deflecting Electrode DJ2
Pin 3-Cathode	Pin 10-Deflecting Electrode DJ1
Pin 4-Anode No.1	Pin 11-Internal Con. Do Not Use
Pin 5-Internal Con. Do Not Use	Pin 12-Heater
Pin 6-Deflecting Electrode DJ3	
Pin 7-Deflecting Electrode DJ4	



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 4. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The angle between the trace produced by DJ₁ and DJ₂ and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° ± 3°.

SUPI



SUPI

OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ANODE-No.2 $\blacksquare$ VOLTAGE	2500 max.	volts
ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Peak positive value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE. . .	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between 1000 and 2500 volts*

Anode-No.1 Voltage . . .	17% to 32% of E_{b2}	volts
Max. Grid-No.1 Voltage for Visual Cutoff	4.5% of E_{b2}	volts
Anode-No.1 Current for Any Operating Condition	-15 to +10	microamp
Deflection Factors:		
DJ1 & DJ2	28 to 38.5	v dc/in./kv of E_{b2}
DJ3 & DJ4	23 to 31	v dc/in./kv of E_{b2}

Examples of Use of Design Ranges:

<i>For anode-No.2 voltages of</i>	<u>1000</u>	<u>2000</u>	<i>volts</i>
Anode-No.1 Voltage . . .	170 - 320	340 - 640	volts
Max. Grid-No.1 Voltage for Visual Cutoff	-45	-90	volts
Deflection Factors:			
DJ1 & DJ2	28 - 38.5	56 - 77	volts dc/in.
DJ3 & DJ4	23 - 31	46 - 62	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting Electrode Circuit $\blacksquare$. . .	5.0 max.	megohms

* Recommended minimum value.

$\blacksquare$ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

$\blacksquare$ Anode No.2 and grid No.2, which are connected together within tube, are referred to herein as anode No.2.

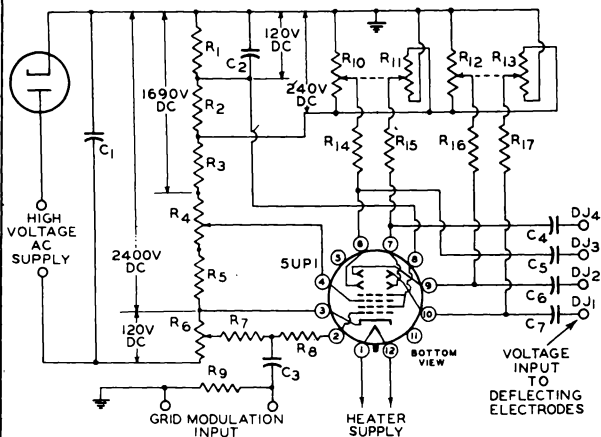


5U1

OSCILLOGRAPH TUBE

5U1

TYPICAL CIRCUIT



92CM-6819

R1 R2: 2.5 Megohms, 0.5 Watt
 R3: 6 Megohms, 3 Watts
 R4: 2-Megohm Potentiometer
 R5: 1 Megohm, 0.5 Watt
 R6: 0.5-Megohm Potentiometer
 R7: 0.5-Megohm, 0.5 Watt
 R8: Not less than 2000 Ohms per
 volt of positive signal
 R9: 5-Megohms, 0.5 Watt

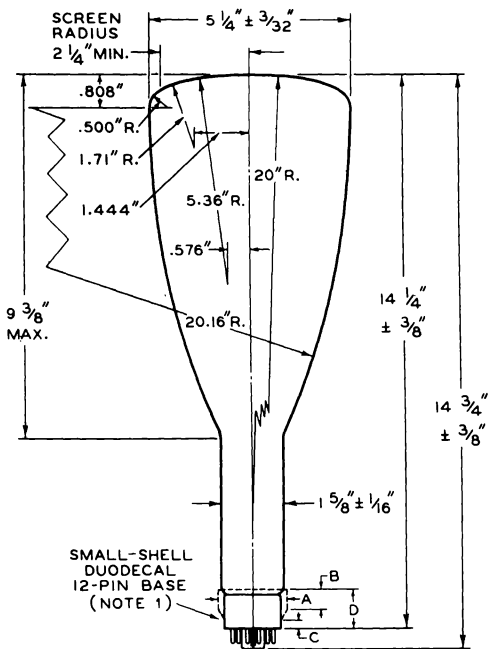
R10 - R11, R12 - R13: Dual Potentiometers, R10, R11, R12, R13:
 0.5 Megohm
 R14 R15 R16 R17: 2.2 Megohms,
 0.5 Watt
 C1: 0.1 μ f, 2500 Volts
 C2: 1 μ f, 200 Volts
 C3: 0.0001 μ f, 2500 Volts
 C4 C5 C6 C7: 0.1 μ f, 600 Volts

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

5UP1



5UP1 OSCILLOGRAPH TUBE



CL OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE 1: THIS BASE MAY BE SUPERSEDED BY AN ALTERNATE BASE WHICH WILL FIT THE SAME SOCKET BUT WHICH WILL HAVE A FLARED SHELL INDICATED BY THE DASHED LINES AND DIMENSIONED APPROXIMATELY AS FOLLOWS:

A = $1.85"$ MAX., B = $0.500"$, C = $0.200"$ MIN., D = $0.925"$.

92CM-6763

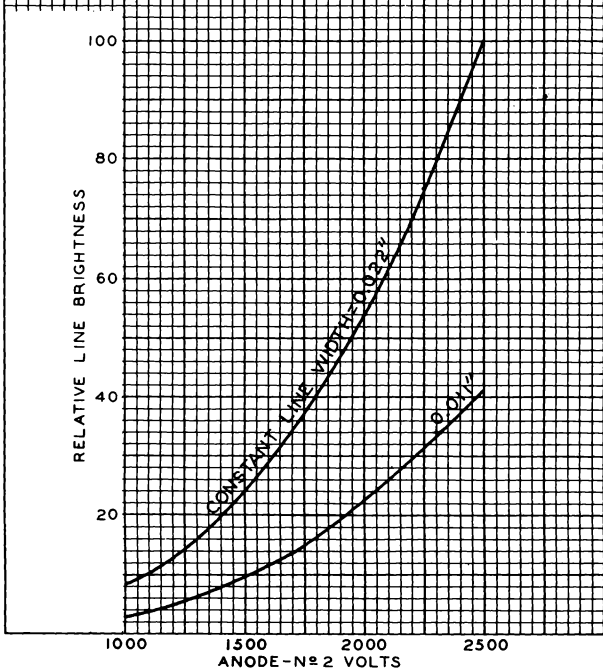


5UP1

5UP1

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE-N $\circ$ 1 VOLTS ADJUSTED
FOR FOCUS



NOV. 7, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

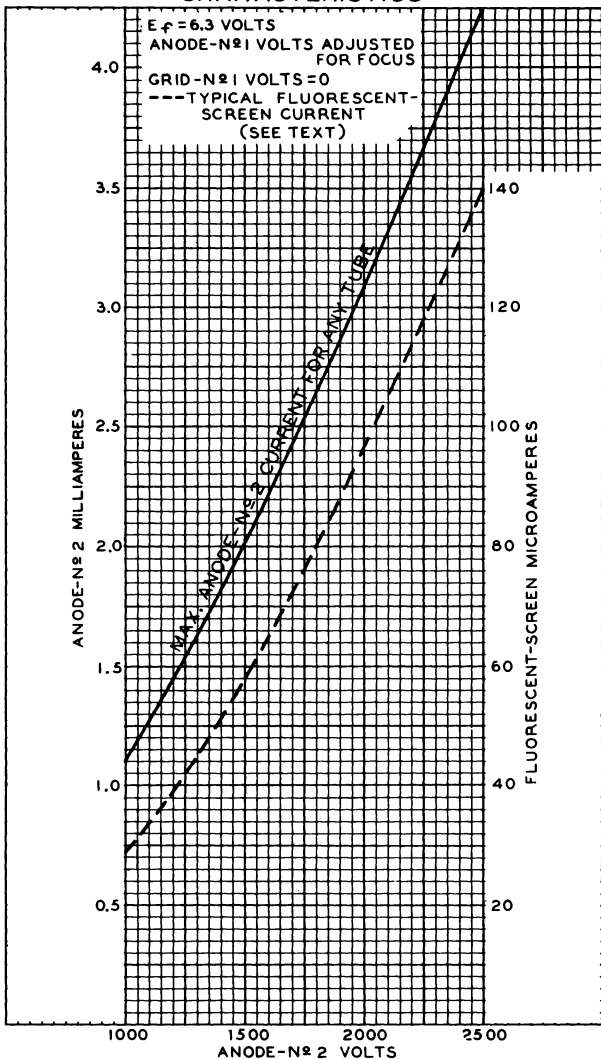
92CM-6808

5U1



5U1

CHARACTERISTICS



OCT. 21, 1949

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

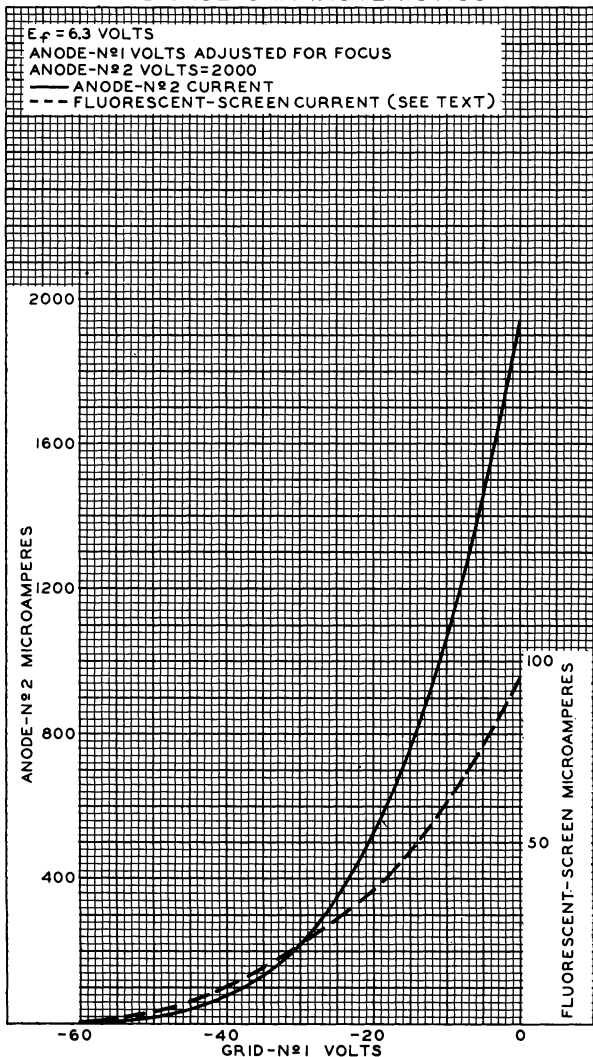
92CM-6811R1



5U1

5U1

AVERAGE CHARACTERISTICS



NOV. 11, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6810



5UP7

5UP7

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 5UP7 is the same as the 5UP1, except that it has a screen of the greenish-yellow, long-persistence type, designated P7. Persistence of useable brightness can be obtained with an anode-No.2 voltage of as low as 1500 volts.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC,
as well as PERSISTENCE CURVES of BUILDUP and DECAY
for the P7 PHOSPHOR are shown at the beginning
of this section



5UP11

5UP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 5UP11 is the same as the 5UP1, except that it has a screen of the short-persistence, blue-fluorescence type designated P11. Its highly actinic fluorescent spot of unusually high brightness makes the 5UP11 particularly useful for photographic recording. Because its improved phosphor has exceptional brightness for a blue screen, the 5UP11 is also quite useful for visual observation of phenomena. Radiation of useable intensity can be obtained with anode-No.2 voltages as low as 1500 volts.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC
of the P11 PHOSPHOR is shown
at the beginning of this section



5WP11

5WP11

TRANSCRIBER KINESCOPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA**General:**

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 7.5 μf Cathode to All Other Electrodes. 5 μf External Conductive Coating to Anode No.2 $\left\{ \begin{array}{l} 500 \text{ max.} \\ 100 \text{ min.} \end{array} \right. \mu\text{f}$

Phosphor (For Curves, see front of this Section). P11

Fluorescence Blue

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angle (Approx.) 50° Overall Length $11-7/16" \pm 3/8"$ Greatest Diameter of Bulb. $5" \pm 1/8"$ Minimum Useful Screen Diameter $4-1/4"$ Raster Size (Approx.) $2-1/2" \times 3-3/8"$

Mounting Position. Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 7-Pin

Basing Designation for BOTTOM VIEW 12C

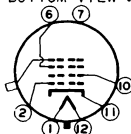
Pin 1-Heater

Pin 2-Grid No.1

Pin 6-Anode No.1

Pin 7-Internal Con.-

Do Not Use



Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater

Cap - Anode No.2

Maximum Ratings, Design-Center Values:

ANODE-No.2 VOLTAGE 27000 max. volts

ANODE-No.1 VOLTAGE 6000 max. volts

GRID-No.2 VOLTAGE 350 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 150 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds. 410 max. volts

After equipment warm-up period 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation:

Anode-No.2 Voltage*. 27000 volts

*: See next page.

FEB. 1, 1949

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5WP11



5WP11

TRANSCRIBER KINESCOPE

Anode-No.1 Voltage Range for		
Anode-No.2 Current of 20 μ amp.	4200 to 5400	volts
Grid-No.2 Voltage**	200	volts
Grid-No.1 Voltage for Visual Cutoff . . .	-42 to -98	volts
Anode-No.2 Current	20	μ amp
Max. Anode-No.1 Current.	25	μ amp
Grid-No.2 Current Range.	-15 to +15	μ amp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	180 min.	ohms
Grid-No.2-Circuit Resistance	390 min.	ohms
Anode-No.1-Circuit Resistance.	6800 min.	ohms
Anode-No.2-Circuit Resistance.	30000 min.	ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

Deflecting Yoke. RCA Type No. 201D11

Hor. Deflection Output Transformer:

For use with 6AS7-G booster scanning tube
and separate high-voltage supply . . . RCA Type No. 204T1

For use with single high-voltage tripler
supply employing 3 183-GT/8016's . . . RCA Type No. 211T2

Ver. Deflection Output Transformer . . . RCA Type No. 204T2

* Brilliance and definition decrease with decreasing anode voltages. In general, anode-No.2 voltage should not be less than 15000 volts.

** Subject variation of $\pm 40\%$ when grid-No.1 voltage cutoff is desired at -70 volts.

OPERATING NOTES

Soft x-rays are produced when the 5WP11 is operated with an anode-No.2 voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

Resolution of better than 700 lines at the center of the reproduced picture can be produced by the 5WP11. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a band-width of at least 10 megacycles.

FEB. 1, 1949

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5WP11

5WP11

TRANSCRIBER KINESCOPE

The screen of the 5WP11 has highly actinic blue radiation, and is particularly effective for photography. The persistence of the radiation is sufficiently short to prevent "carry over" from one frame to the next. The persistence is dependent to some extent on the current density in the focused spot, and decreases with current density.

Operation of the 5WP11 results in gradual browning of the face. The rate of browning increases markedly with increase in anode-No.2 voltage, is proportional to beam current, and is inversely proportional to the scanned area. The browning is most noticeable during initial operation; thereafter, a gradual increase in the amount of browning will be observed during the life of the tube.

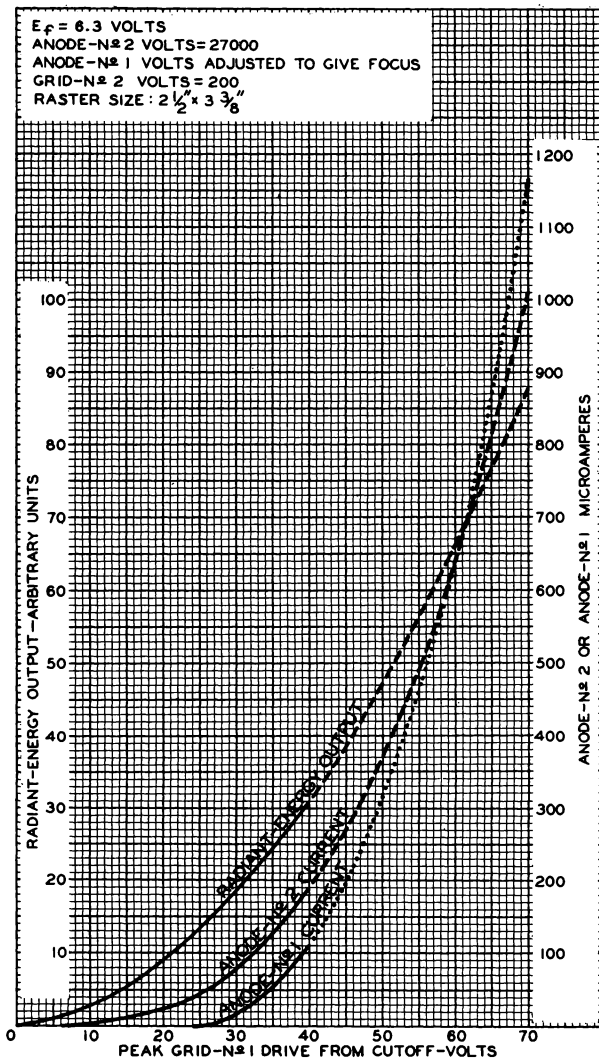
OUTLINE DIMENSIONS for the 5WP11 are the same
as those for the 5WP15

5WP11



5WP11

AVERAGE CHARACTERISTICS



OCTOBER 28, 1948

TUBE DEPARTMENT

92CM-7105

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5WP15

5WP15 FLYING-SPOT CATHODE-RAY TUBE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

For use in Flying-Spot Video-Signal Generators

DATA**General:**

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes 7.5 μf Cathode to All Other Electrodes 5 μf External Conductive Coating to Anode No.2 $\left\{ \begin{array}{l} 500 \text{ max. } \mu\text{f} \\ 100 \text{ min. } \mu\text{f} \end{array} \right.$

Phosphor No.15

Fluorescence:

Visible Radiation Blue-Green

Invisible Radiation Near Ultraviolet

Phosphorescence:

Persistence of Visible Radiation Very Short

Persistence of Invisible Radiation Extremely Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 50° Overall Length $11-7/16" \pm 3/8"$ Greatest Diameter of Bulb $5" \pm 1/8"$ Minimum Useful Screen Diameter $4-1/4"$ Minimum Inside Diameter of Deflecting Coil $1.505"$

Mounting Position Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 7-Pin

Basing Designation for BOTTOM VIEW 12C

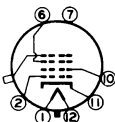
Pin 1-Heater

Pin 2-Grid No.1

Pin 6-Anode No.1

Pin 7-Internal Con.-

Do Not Use



Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater

Cap - Anode No.2

Maximum Ratings, Design-Center Values:

ANODE-No.2 VOLTAGE 27000 max. volts

ANODE-No.1 VOLTAGE 6000 max. volts

GRID-No.2 VOLTAGE 350 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 150 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 125 max. volts

Heater positive with respect to cathode. 125 max. volts

JUNE 15, 1948

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5WP15



5WP15 FLYING-SPOT CATHODE-RAY TUBE

Typical Operation:

Anode-No.2 Voltage*	20000	volts
Anode-No.1 Voltage Range for		
Anode-No.2 Current of 150 μ amp.	3000 to 3800	volts
Grid-No.2 Voltage**	200	volts
Grid-No.1 Voltage for Visual Cutoff ⁰	-42 to -98	volts
Anode-No.2 Current	150	μ amp
Max. Anode-No.1 Current	200	μ amp
Grid-No.2 Current Range	-15 to +15	μ amp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	180 min.	ohms
Grid-No.2-Circuit Resistance	390 min.	ohms
Anode-No.1-Circuit Resistance	6800 min.	ohms
Anode-No.2-Circuit Resistance	30000 min.	ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

Deflecting Yoke. RCA Type No. 201D11

* Brilliance and definition decrease with decreasing anode voltages. In general, anode-No.2 voltage should not be less than 15000 volts.

** Subject to variation of $\pm 40\%$ when grid-No.1 voltage cutoff is desired at -70 volts.

⁰ Visual extinction of undeflected focused spot.

OPERATING NOTES

Soft x-rays are produced when the 5WP15 is operated with an anode-No.2 voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

Resolution of better than 700 lines at the center of the reproduced picture can be produced by the 5WP15. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a band-width of at least 10 megacycles.

The blue-green radiation decays hyperbolically to about 30 per cent of its initial value in 1.5 microseconds. The ultra-



5WP15

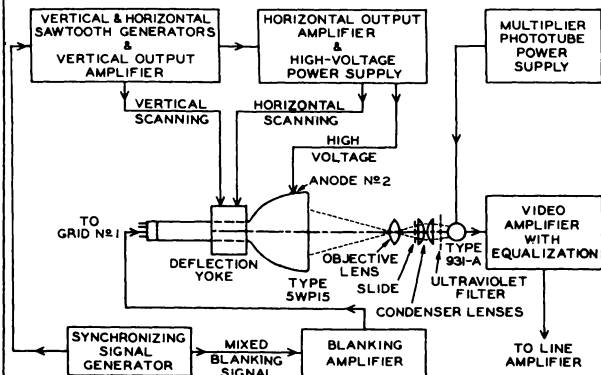
5WP15 FLYING-SPOT CATHODE-RAY TUBE

violet radiation has an equivalent exponential decay with a time constant less than 0.05 microsecond. The frequency response of the ultraviolet radiation is substantially constant for a range of 3 megacycles and then decreases exponentially toward zero at approximately 100 megacycles.

The P15 screen is more sensitive to heat than other standard types of phosphors. It shows a decrease in efficiency with increase in temperature. Use of forced air from a small blower directed against the face of the tube is, therefore, suggested to counteract the heating effect of the electron beam when optimum efficiency of the screen is desired at maximum anode-No. 2 current.

Operation of the 5WP15 results in gradual browning of the face. The rate of browning increases markedly with increase in anode-No. 2 voltage, is proportional to beam current, and is inversely proportional to the scanned area. The browning is most noticeable during initial operation; thereafter, a gradual increase in the amount of browning will be observed during the life of the tube.

BLOCK DIAGRAM OF FLYING-SPOT VIDEO SIGNAL GENERATOR SYSTEM FOR SLIDE TRANSPARENCIES



92CS-6919

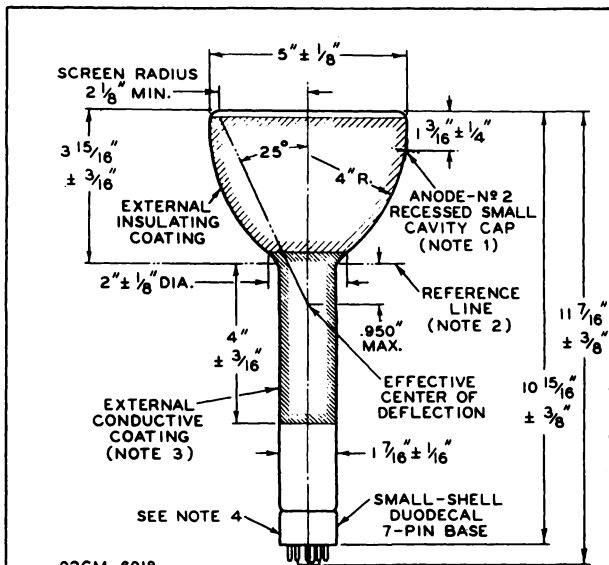
Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

SWP15



SWP15

FLYING-SPOT CATHODE-RAY TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE-NO. 2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . ANODE-NO. 2 TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE $1.500" + .003" - .000"$ AND $2"$ LONG WILL REST ON BULB CONE.

NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUND.

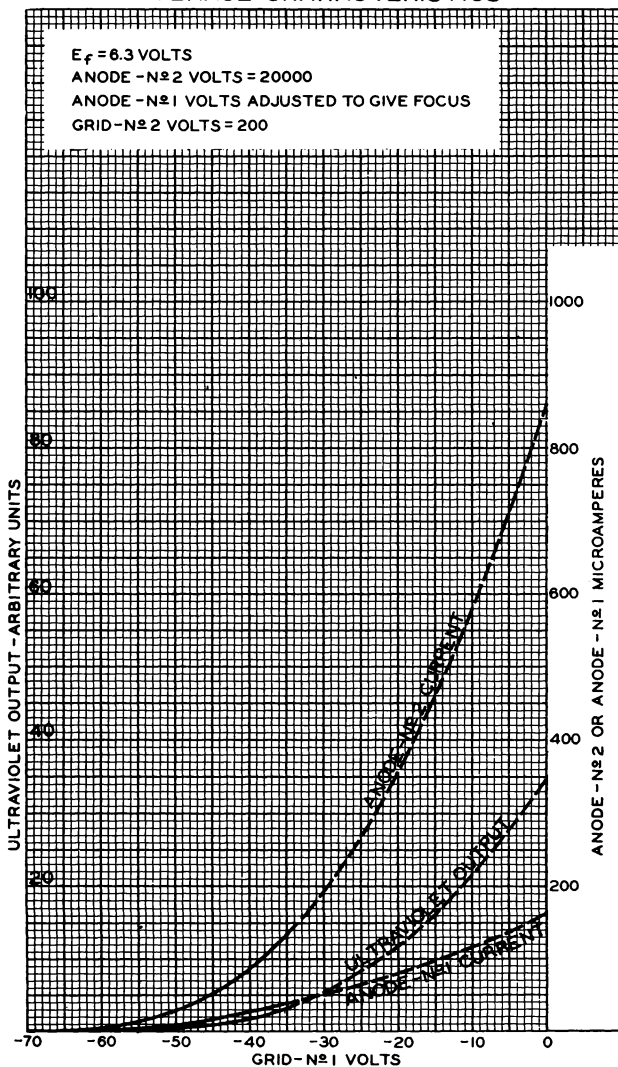
NOTE 4: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.



5WPI5

5WPI5

AVERAGE CHARACTERISTICS



DEC. 5, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

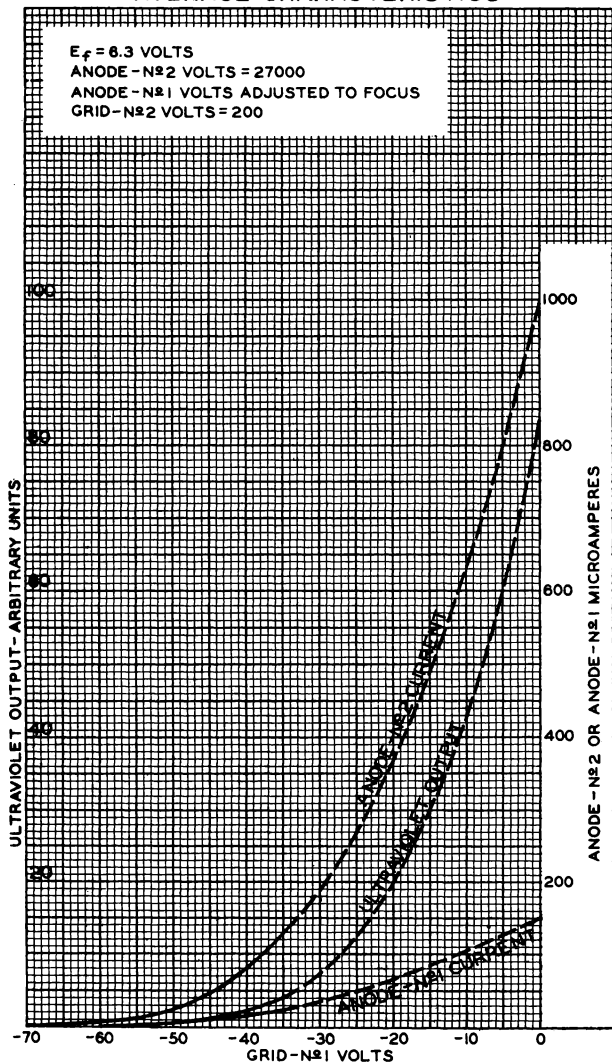
92CM-6916

5WP15



5WP15

AVERAGE CHARACTERISTICS



DEC. 8, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6917



5ZP16

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

For use in Flying-Spot Video-Signal Generators

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 8 μf

Cathode to All Other Electrodes. 5 μf

External Conductive Coating to Anode { 500 max. μf

{ 100 min. μf

Phosphor (For Curves, see front of this Section) No.16

Fluorescence Violet and Near-Ultraviolet

Phosphorescence. Violet and Near-Ultraviolet

Persistence. Extremely Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angle (Approx.) 40°

Overall Length $14\frac{3}{8}'' \pm \frac{3}{8}''$

Greatest Diameter of Bulb. $5'' \pm \frac{1}{8}''$

Minimum Useful Screen Diameter $4\frac{1}{4}''$

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Base Small-Shell Duodecal 7-Pin (JETEC No.B7-51)

BOTTOM VIEW

Pin 1-Heater

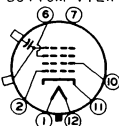
Pin 2-Grid No.1

Pin 6-Grid No.3

Pin 7-Internal Con.-

Do Not Use

Pin 10-Grid No.2



Pin 11-Cathode

Pin 12-Heater

Cap - Anode

C-External

Conductive

Coating

SOCKET CONTACTS CORRESPONDING TO VACANT

PIN POSITIONS 3, 4, 5, 8, & 9 SHOULD

BE REMOVED

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE. 27000 max. volts

GRID-No.3 VOLTAGE. 7000 max. volts

GRID-No.2 VOLTAGE. 350 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 150 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds. 410 max. volts

After equipment warm-up period 150 max. volts

Heater positive with respect to cathode. 150 max. volts

5ZP16



5ZP16

FLYING-SPOT CATHODE-RAY TUBE

Typical Operation:

Anode Voltage*	20000	27000	volts
Grid-No.3 Voltage Range for Anode Current as Indicated .	4700 $\pm$ 12%	6300 $\pm$ 12%	volts
Grid-No.2 Voltage**	200	200	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot ^o	-70	-70	volts
Anode Current	25	15	μ amp
Max. Grid-No.3 Current for Anode Current as Indicated .	75	25	μ amp
Grid-No.2 Current Range. . . .	-15 to +15	-15 to +15	μ amp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 20000 volts.

** Subject to variation of $\pm$ 40% when grid-No.1 voltage cutoff is desired at the average cutoff value of -70 volts.

^o Subject to variation of $\pm$ 40% when grid-No.2 voltage is maintained at 200 volts.

OPERATING NOTES

X-Ray Warning. X-ray radiation is produced at the face of the 5ZP16 when it is operated at its normal anode voltage. These rays can constitute a health hazard unless the tube is adequately shielded for x-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection against personal injury.

Resolution of better than 1000 lines at the center of the reproduced picture can be produced by the 5ZP16 when it is operated with 27000 volts on the anode. At lower anode voltages, the resolution capability decreases. To obtain high resolution in the horizontal direction, it is necessary to use a video amplifier having a bandwidth of about 20 megacycles.

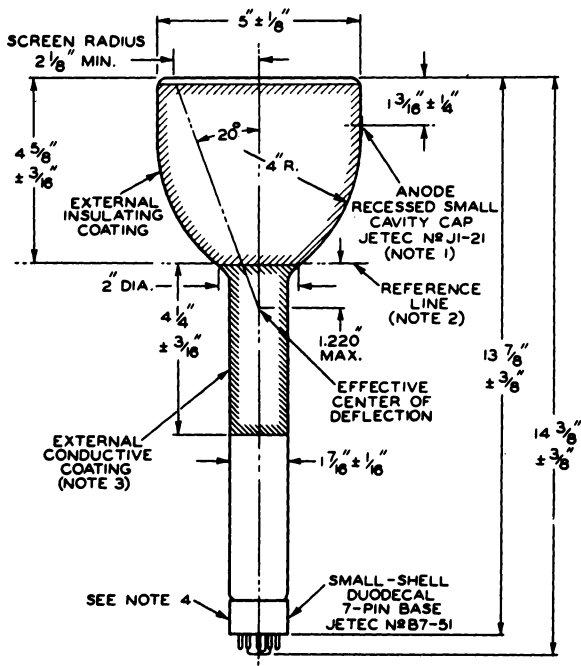
The **ultraviolet output** of the 5ZP16 is a linear function of the anode current. For any particular value of anode current, the ultraviolet output is approximately 50 per cent higher when the 5ZP16 is operated with 27000 volts on the anode than when operated with 20000 volts.



5ZP16

5ZP16

FLYING-SPOT CATHODE-RAY TUBE



92CM-7574

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY INTERSECTION OF PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

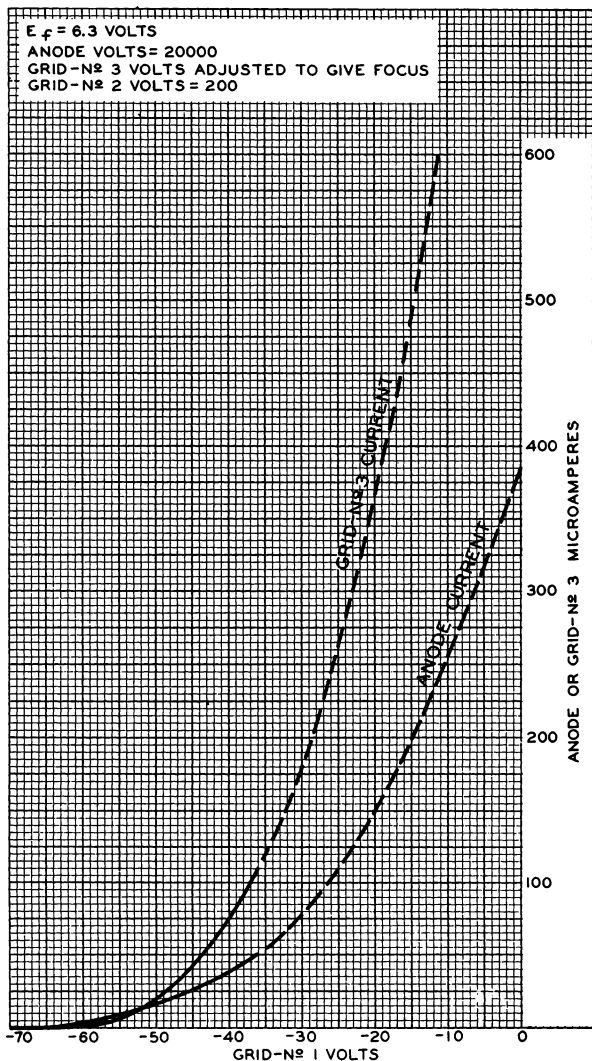
NOTE 4: $\angle$ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5ZP16



5ZP16

AVERAGE CHARACTERISTICS



DEC. 26, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

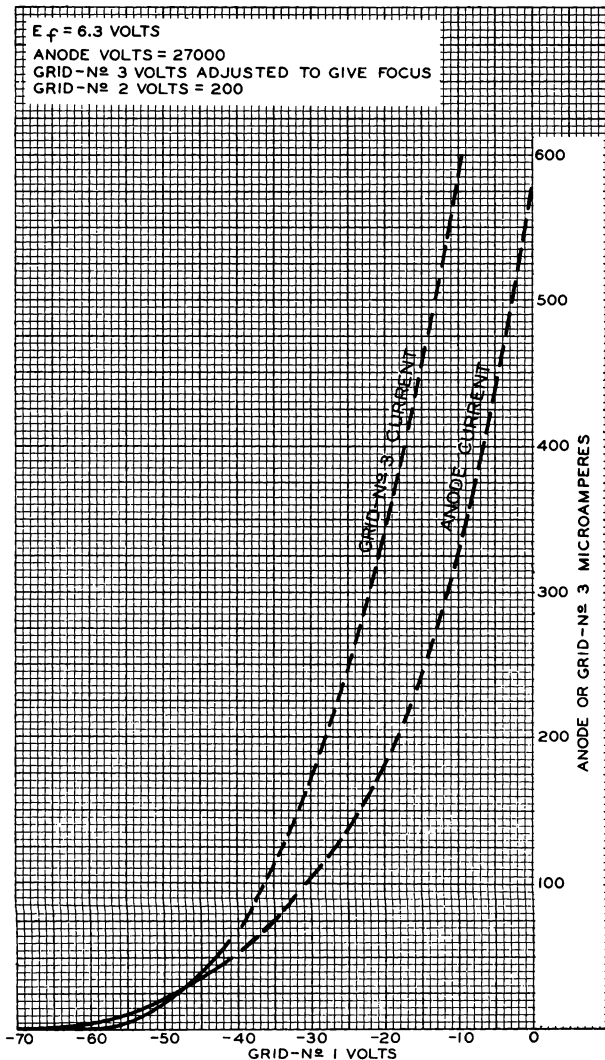
92CM-7575



5ZP16

5ZP16

AVERAGE CHARACTERISTICS





7BP7-A

OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

7BP7-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.5 μ f
Grid No.2 to All Other Electrodes. 7 μ f
Cathode to All Other Electrodes. 5 μ f

Phosphor (For Curves, see front of this Section) No.7

Fluorescence Blue

Phosphorescence. Greenish-Yellow

Persistence of Phosphorescence Long

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 53°

Overall Length 13-1/4" $\pm$ 3/8"

Greatest Diameter of Bulb. 7" $\pm$ 1/8"

Maximum Useful Screen Diameter 6"

Mounting Position. Any

Cap. Recessed Small Ball

Base Long Medium-Shell Octal 8-Pin

BOTTOM VIEW

Pin 1-No
Connection

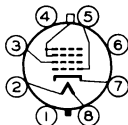
Pin 2-Heater

Pin 3-Grid No.2

Pin 4-No

Connection

Pin 5-Grid No.1



Pin 6-No

Connection

Pin 7-Cathode

Pin 8-Heater

Cap - Anode,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE* VOLTAGE 8000 max. volts

GRID-No.2 VOLTAGE. 700 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value^o 0 max. volts

Positive peak value. 2 max. volts

PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation:

Anode Voltage* 4000 7000 volts

Grid-No.2 Voltage. 250 250 volts

Grid-No.1 Voltage Range^o -25 to -70 -25 to -70 volts

Focusing-Coil Current[▲] 75 to 102 99 to 135 ma

Spot Position. # -

●, □, *, ○, ▲, #: See next page.

JUNE 15, 1948

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7BP7-A



7BP7-A OSCILLOGRAPH TUBE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance 150 min. ohms

Grid-No.2-Circuit Resistance 820 min. ohms

Anode-Circuit Resistance 9100 min. ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

RCA Focusing Coil. RCA Type No. 202D1

- Anode and grid No.3, which are connected together within tube, are referred to herein as anode.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
- * Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.
- For visual extinction of undeflected focused spot.
- ▲ For JETEC Focusing Coil No.106, or equivalent, with center line of air gap approximately 2-3/4" from reference line (see Outline Drawing), and total anode current of 200 microamperes.
- # The center of the undeflected, unfocused spot will fall within a circle having 12 mm radius concentric with the center of the tube face.

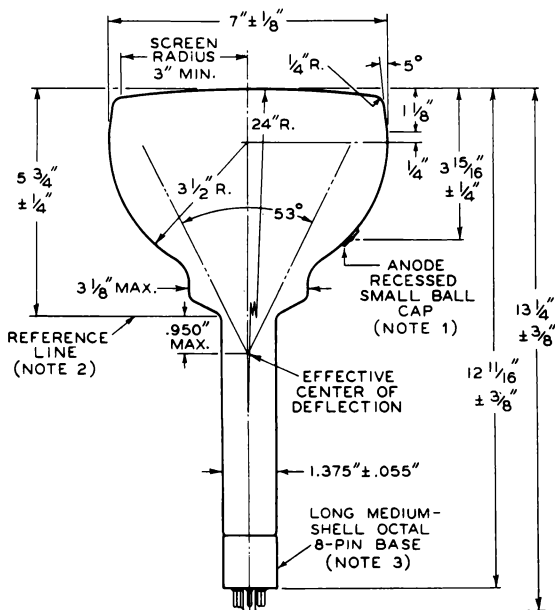
JUNE 15, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA



7BP7-A



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . ANODE TERMINAL IS ON SAME SIDE OF TUBE AS PIN No.5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE
1.430" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB
CONE.

NOTE 3: C OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

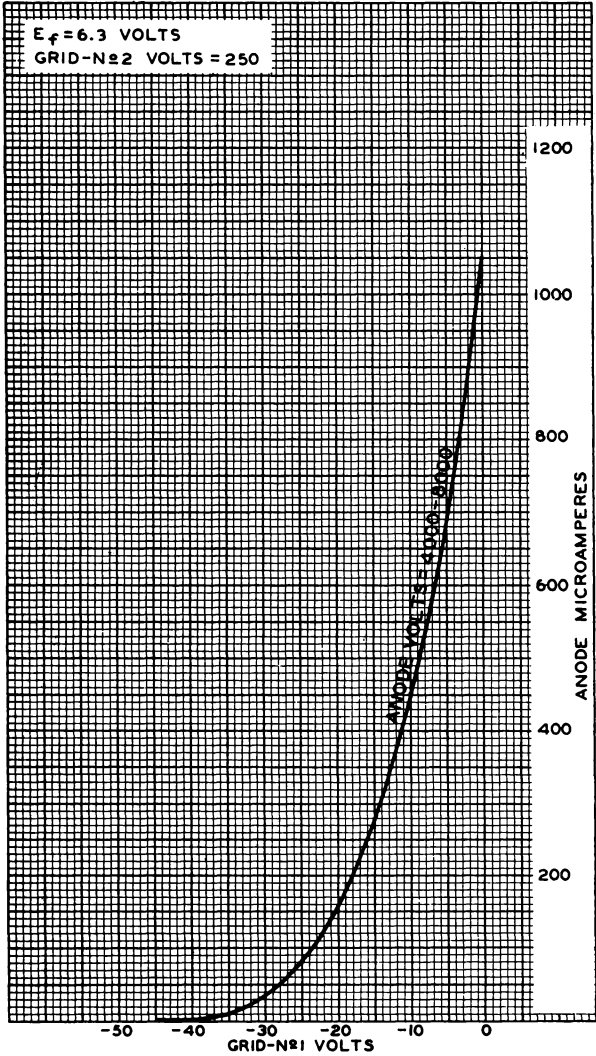
92CM-6367R3

7BP7-A



7BP7-A

AVERAGE CHARACTERISTIC



MAR.22,1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6373R1



7CPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS, MAGNETIC DEFLECTION

General:

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.0 μpf Cathode to All Other Electrodes. 6.5 μpf

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence Medium

Focusing Method. Electrostatic

Deflection Method. Magnetic

Solid Deflection Angle (Approx.) 57° Overall Length $13\text{--}7/16" \pm 3/8"$ Greatest Diameter of Bulb. $7" \pm 1/8"$ Minimum Useful Screen Diameter $6\text{--}1/2"$

Cap. Recessed Small Ball

Mounting Position. Any

Base Long Medium-Shell Octal 8-Pin

Basing Designation for BOTTOM VIEW 6AZ

Pin 1—No Connection

Pin 2—Anode No.1

Pin 3—No Connection

Pin 4—Grid No.2

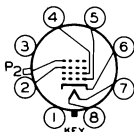
Pin 5—Grid No.1

Pin 6—Cathode

Pin 7—Heater

Pin 8—Heater

Cap—Anode No.2



Maximum Ratings, Design-Center Values:

ANODE—No.2 VOLTAGE 8000 max. volts

ANODE—No.1 VOLTAGE 2400 max. volts

GRID—No.2 VOLTAGE. 300 max. volts

GRID—No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 2 max. volts

PEAK HEATER—CATHODE VOLTAGE:

Heater negative with respect to cathode. 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation:

Anode—No.2 Voltage*. 4000 7000 . . volts

Anode—No.1 Voltage for

Focus at 75% of Grid—No.1

Voltage for Cutoff^o . 780 1365 . . volts

Grid—No.2 Voltage. 250 250 . . volts

Grid—No.1 Voltage for

Visual Cutoff**. -45 -45 . . volts

*, ^o, **: See next page.

7CPI



7CPI

OSCILLOGRAPH TUBE

- * Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, the anode-No.2 voltage should not be less than 4000 volts.
- o Individual tubes may require between -30% and +20% of the values shown with grid-No.1 voltages between zero and cutoff.
- ** Visual extinction of undeflected focused spot. Supply should be adjustable to $\pm 50\%$ of indicated value.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms



7CPI

Technical drawing of a vacuum tube pinout diagram. The diagram shows a cross-section of the tube with various dimensions and labels. Key features include:

- SCREEN RADIUS:** 3.083"
- ANODE NO. 2 RECESSED SMALL BALL CAP (NOTE 1):** Indicated by a dashed line and a dimension of 28.5°.
- EFFECTIVE CENTER OF DEFLECTION:** Indicated by a dashed line and a dimension of 7" R.
- REFERENCE LINE (NOTE 2):** A horizontal line passing through the center of the tube.
- LONG MEDIUM-SHELL OCTAL 8-PIN BASE (NOTE 3):** The base of the tube.
- Dimensions:**
 - Top width: 7" ± 1/8"
 - Top radius: 3 1/4" MIN.
 - Top height: 3 5/8" ± 1/4"
 - Top radius: 1 1/2" R.
 - Top radius: 1.134"
 - Top radius: 3/4" R.
 - Top radius: 2" R.
 - Top radius: 3" R.
 - Top radius: 2.237"
 - Top radius: 20" R.
 - Top radius: 1.712"
 - Top radius: 3 1/8" MAX.
 - Top height: 6" ± 1/4"
 - Top height: 13 7/16" ± 3/8"
 - Top height: 12 7/8" ± 3/8"
 - Top height: 1.375" ± .055"
 - Top height: .950" MAX.

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE No.2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . ANODE No.2 TERMINAL IS ON SAME SIDE OF TUBE AS PIN No.2.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

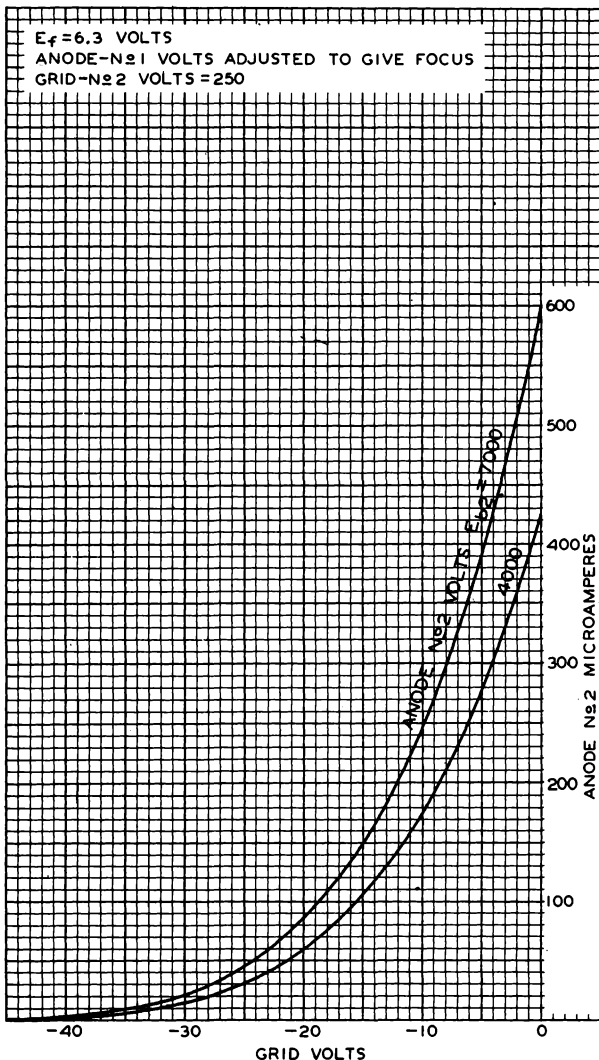
92CM-6364R2

7CPI



7CPI

AVERAGE CHARACTERISTICS



AUG. 23, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-6424



7DP4

KINESCOPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf ←Cathode to All Other Electrodes. 5 μf External Conductive Coating to Anode No.2 { 1500 max. μf
400 min. μf

Phosphor (For Curves, see front of this Section) No.4

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angle (Approx.) 50°

Ion Trap Magnetic

External Coating Conductive

Overall Length 14-1/16" $\pm$ 3/8"Greatest Diameter of Bulb. 7-3/16" $\pm$ 1/8"

Minimum Useful Screen Diameter 6"

Raster Size (Approx.) 4" x 5-1/2"

Mounting Position. Any

Cap. Recessed Small Cavity

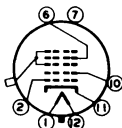
Base Small-Shell Duodecal 7-Pin

BOTTOM VIEW

Pin 1-Heater

Pin 2-Grid No.1

Pin 6-Anode No.1

Pin 7-Internal Con.-
Do Not Use

Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater

Cap - Anode No.2,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE-No.2[■] VOLTAGE[●] 8000 max. volts

ANODE-No.1 VOLTAGE 2400 max. volts

GRID-No.2 VOLTAGE 410 max. volts

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 150 max. volts ←

Heater positive with respect to cathode. 150 max. volts ←

■, ●: See next page.

← Indicates a change.

NOV. 15, 1949

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7DP4



7DP4

KINESCOPE

Typical Operation:

Anode-No.2 Voltage*	6000	volts
Anode-No.1 Voltage for Focus ^o	1215 to 1645	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage for Visual Cutoff**	-27 to -63	volts
Max. Anode-No.1 Current Range	-15 to +10	μamp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
------------------------------	----------	---------

→ **Minimum Circuit Values:**

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 ma. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-No.1-Circuit Resistance	2700 min.	ohms
Anode-No.2-Circuit Resistance	9100 min.	ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

Ion-Trap Magnet*	RCA Type No.203D1
→ Deflecting Yoke*	RCA Type No.201D12

- Anode No.2 and grid No.3, which are connected together within tube, are referred to herein as anode No.2.
- The product of anode-No.2 voltage and average anode-No.2 current should never exceed 6 watts.
- * Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 5000 volts.
- o With the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 12 foot-lamberts on a 4" x 5-1/2" picture area.
- ** Visual extinction of undeflected focused spot.
- ⚡ The dc current required by this magnet is approx. 70 ma. for the typical operating conditions shown.
- ★ The horizontal deflecting-coil current required by this yoke to produce 5-1/2" picture width is approx. 410 ma. peak-to-peak under the typical operating conditions shown. The current varies directly as the square root of the anode-No.2 voltage.

→ Indicates a change.

NOV. 15, 1949

TUBE DEPARTMENT

DATA

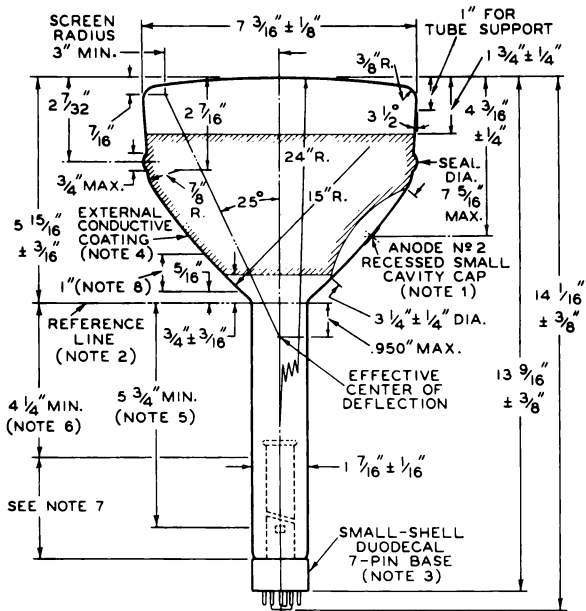
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



7DP4

KINESCOPE

7DP4



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE No. 2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE No. 2 TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH

7DP4



7DP4 KINESCOPE

(continued from preceding page)

PIN No. 6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN No. 6 AND SOUTH POLE TO PIN No. 12.

NOTE 6: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.

NOTE 7: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 8: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED CLEAR AREA AROUND ANODE CAP.

92CM-6664R1



7DP4

7DP4

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

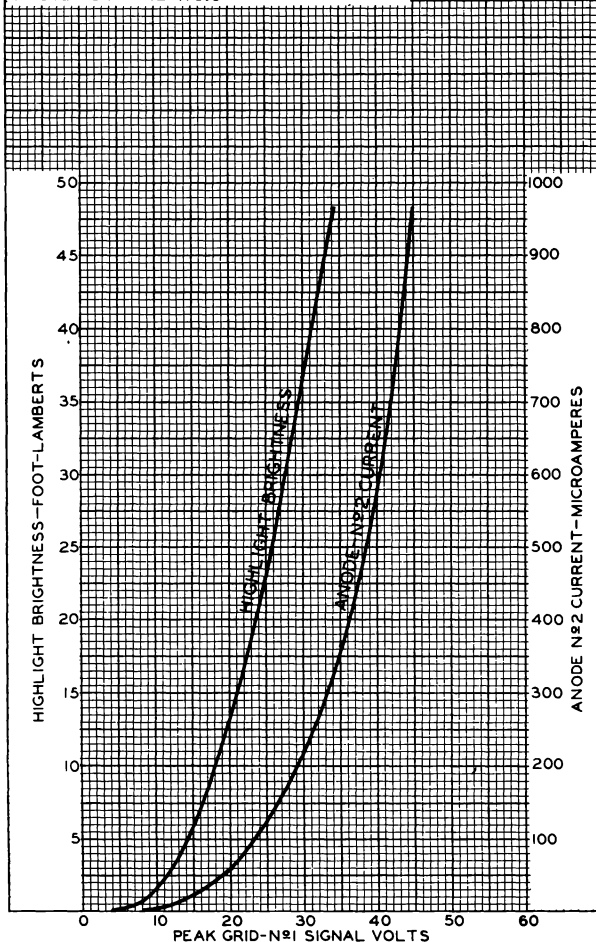
ANODE-№2 VOLTS=6000

ANODE-№1 VOLTS ADJUSTED TO GIVE FOCUS

GRID-№2 VOLTS=250

GRID-№1 BIASED TO CUTOFF

RASTER SIZE 4.2" X 5.6"



OCT. 14, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6674RI



7JPI

7JPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 $\mu\mu\text{f}$ DJ₁ to DJ₂ 3 $\mu\mu\text{f}$ DJ₃ to DJ₄ 2 $\mu\mu\text{f}$ DJ₁ to All Other Electrodes. 9 $\mu\mu\text{f}$ DJ₂ to All Other Electrodes. 9 $\mu\mu\text{f}$ DJ₃ to All Other Electrodes. 7 $\mu\mu\text{f}$ DJ₄ to All Other Electrodes. 7 $\mu\mu\text{f}$

Phosphor (For Curves, see front of this Section) No.1

Fluorescence and Phosphorescence Green

Persistence of Phosphorescence Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Deflecting-Electrode Arrangement See Outline Drawing

Overall Length 14-1/2" $\pm$ 3/8"Greatest Diameter of Bulb. 7" $\pm$ 1/8"

Minimum Useful Screen Diameter 6"

Mounting Position. Any

Base Medium-Shell Diheptal 12-Pin

Basing Designation for BOTTOM VIEW 14G1

Pin 1-Heater

Pin 2-Cathode

Pin 3-Grid No.1

Pin 4-No

Connection

Pin 5--Anode No.1

Pin 7-Deflecting

Electrode

DJ₃

Pin 8-Deflecting

Electrode

DJ₄

Pin 9-Anode No.2,

Grid No.2

Pin 10-Deflecting

Electrode

DJ₂

Pin 11-Deflecting

Electrode

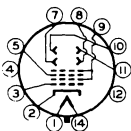
DJ₁

Pin 12-Internal

Connection-

Do Not Use

Pin 14-Heater

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 2.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ₁ and DJ₂ by an angular tolerance (measured about the tube axis) of 10°. Angle between DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is 90° $\pm$ 3°.

7JPI



7JPI

OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ANODE-No.2 ^o VOLTAGE ^o	6000 max.	volts
ANODE-No.1 VOLTAGE	2800 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND		
ANY DEFLECTING ELECTRODE . . .	750 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between 1000* and 6000 volts

Anode-No.1 Voltage	27% to 40% of E_{b2}	volts
Max. Grid-No.1 Voltage		
for Visual Cutoff	2.8% of E_{b2}	volts
Anode-No.1 Current for any		
Operating Condition.	-15 to +10	microamp
Deflection Factors:		
DJ1 & DJ2.	31 to 41 v dc/in./kv of E_{b2}	
DJ3 & DJ4.	25 to 34 v dc/in./kv of E_{b2}	
Spot Position.	#	

Examples of Use of Design Ranges:

For anode-No.2 voltage of	2000	4000	volts
Anode-No.1 Voltage	540-800	1080-1600	volts
Max. Grid-No.1 Voltage			
for Visual Cutoff	-56	-112	volts
Deflection Factors:			
DJ1 & DJ2.	62-82	124-164	volts dc/in.
DJ3 & DJ4.	50-68	100-136	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-		
Electrode Circuit ^o	5.0 max.	megohms

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	220 min.	ohms
--	----------	------

●, □, *, #, o: See next page.

JAN. 1, 1951

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1



7JPI

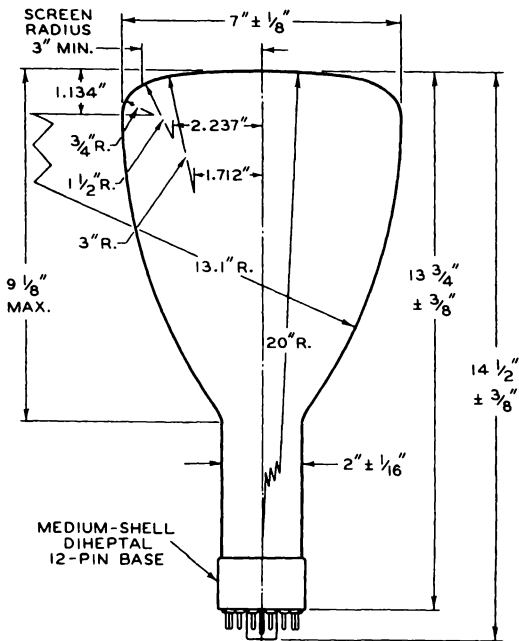
7JPI

OSCILLOGRAPH TUBE

Anode-No.1-Circuit Resistance. 3000 min. ohms
 Anode-No.2-Circuit Resistance. 6800 min. ohms

The resistors used should be capable of withstanding the applied voltage.

- Anode No.2 and grid No.2, which are connected together within tube, are referred to herein as anode No.2.
- For operation at or near 0 volts on grid No.1 and with 4000 to 6000 volts on anode No.2, it is essential that the effective resistance of the anode-No.2 supply be adequate to limit the anode-No.2 input power to 6 watts.
- * Brilliance and definition decrease with decreasing anode-No.2 voltage. A value as low as 1000 volts is recommended only for low-velocity deflection and low ambient-light levels.
- # The center of the undeflected, focused spot will fall within a circle having a 10-mm radius concentric with the center of the tube face.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



92CM-6667

† OF BULB WILL NOT DEViate MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

JAN. 1, 1951

TUBE DEPARTMENT

TENTATIVE DATA 2

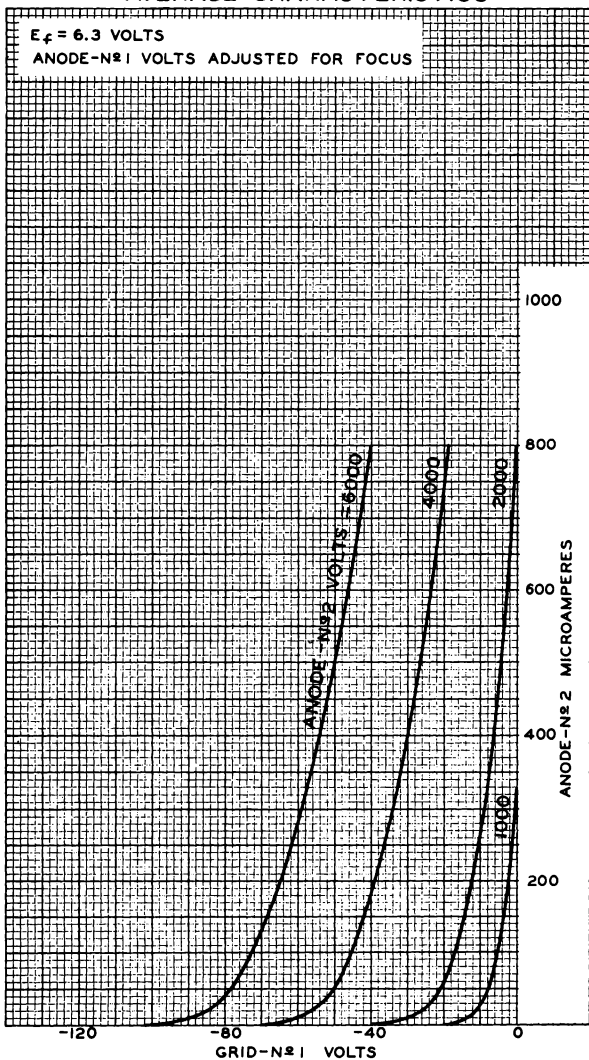
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7JPI



7JPI

AVERAGE CHARACTERISTICS



AUGUST 4, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7521



7JP4 KINESCOPE

ELECTROSTATIC FOCUS—ELECTROSTATIC DEFLECTION
Supersedes Type 7GP4*

7JP4

General:

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 8.5 μf

Cathode to All Other Electrodes. 9.5 μf

DJ₁ to DJ₂ 3.5 μf

DJ₃ to DJ₄ 2.0 μf

DJ₁ to All Other Electrodes. 11.0 μf

DJ₂ to All Other Electrodes. 11.0 μf

DJ₃ to All Other Electrodes. 8.0 μf

DJ₄ to All Other Electrodes. 8.0 μf

Phosphor (For Curves, see front of this Section) No.4

Fluorescence White

Persistence Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Overall Length $14\frac{1}{2}'' \pm \frac{3}{8}''$

Greatest Diameter of Bulb. $7'' \pm \frac{1}{8}''$

Minimum Useful Screen Diameter 6"

Raster Size. $4'' \times 5\frac{1}{2}''$

Mounting Position. Any

Base Medium-Shell Diheptal 12-Pin

Basing Designation for BOTTOM VIEW 14-G

Pin 1—Heater

Pin 2—Cathode

Pin 3—Grid No.1

Pin 4—No

Connection

Pin 5—Anode No.1

Pin 7—Deflecting

Electrode

DJ₃

Pin 8—Deflecting

Electrode

DJ₄

Pin 9—Anode No.2,

Grid No.2

Pin 10—Deflecting

Electrode

DJ₂

Pin 11—Deflecting

Electrode

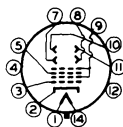
DJ₁

Pin 12—Internal

Connection—

Do Not Use

Pin 14—Heater



DJ₁ and DJ₂ are nearer the screen

DJ₃ and DJ₄ are nearer the base

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 2.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ₁ and DJ₂ by an angular tolerance (measured about the tube axis) of 10° .

The angle between the trace produced by DJ₁ and DJ₂ and the trace produced by DJ₃ and DJ₄ is $90^\circ \pm 3^\circ$.

* The 7JP4 replaces the 7GP4 provided no connections are made to the 7GP4 socket contacts for pins 4 and 12.

7JP4



7JP4 KINESCOPE

Maximum Ratings, Design-Center Values:

ANODE-No.2 & GRID-No.2 VOLTAGE	6000 max.	volts
ANODE-No.1 VOLTAGE	2800 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value#	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2		
AND ANY DEFLECTING ELECTRODE. . .	750 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not		
exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period . . .	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between 3000* and 6000 volts

Anode-No.1 Voltage		
for Focus [□]	27% to 40% of E_{b2}	volts
Grid-No.1 Voltage for		
Visual Cutoff	1.2% to 2.8% of E_{b2}	volts
Anode-No.1 Current for Any		
Operating Condition	-15 to +10	μ amp
Deflection Factors:		
DJ ₁ & DJ ₂	31 to 41	v dc/in./kv of E_{b2}
DJ ₃ & DJ ₄ *	25 to 34	v dc/in./kv of E_{b2}

Examples of Use of Design Ranges:

For anode-No.2 voltage of 6000 volts

Anode-No.1 Voltage	1620 to 2400	volts
Grid-No.1 Voltage for Visual Cutoff	-72 to -168	volts
Deflection Factors:		
DJ ₁ & DJ ₂	186 to 246	volts dc/in.
DJ ₃ & DJ ₄	150 to 204	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting		
Electrode Circuit [○] .	5.0 max.	megohms

Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	220 min.	ohms
Anode-No.1-Circuit Resistance.	3000 min.	ohms
Anode-No.2-Circuit Resistance.	6800 min.	ohms

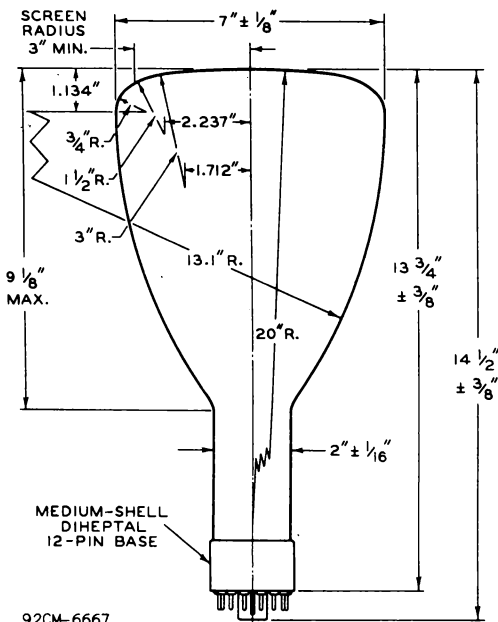
#, *, □, ○: See next page.



7JP4 KINESCOPE

7JP4

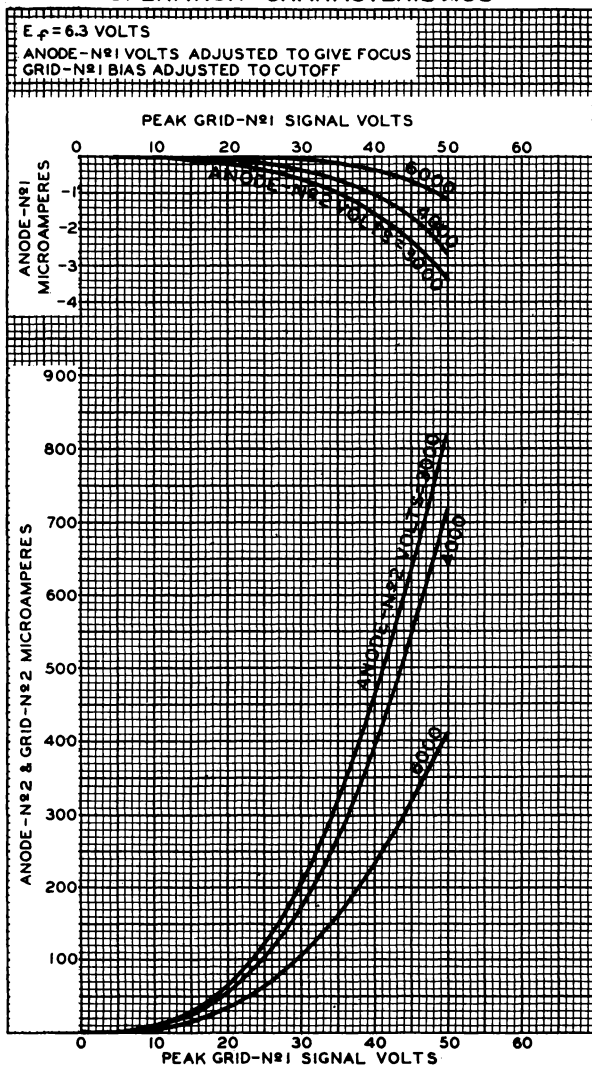
- # At or near this rating, with 4000 to 6000 volts on anode No.2, the effective resistance of the anode-No.2 supply should be adequate to limit the anode-No.2 input power to 6 watts.
- * Brilliance and definition decrease with decreasing anode-No.2 voltage.
- With the combined grid-No.1 bias voltage and video-signal voltage adjusted for a highlight brightness of 12 foot-lamberts on a 4" x 5-1/2" picture area.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.
- The 7JP4 is designed to be used in television circuits with horizontal deflection applied to deflecting electrodes DJ_3 and DJ_4 , and should be so used to obtain maximum picture width. When the 7JP4 is operated in this way, the deflecting voltage required to produce the vertical height is approximately the same as that required to produce the horizontal width of a television picture of standard proportions.



☉ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

7JP 4

OPERATION CHARACTERISTICS



AUG. 21, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

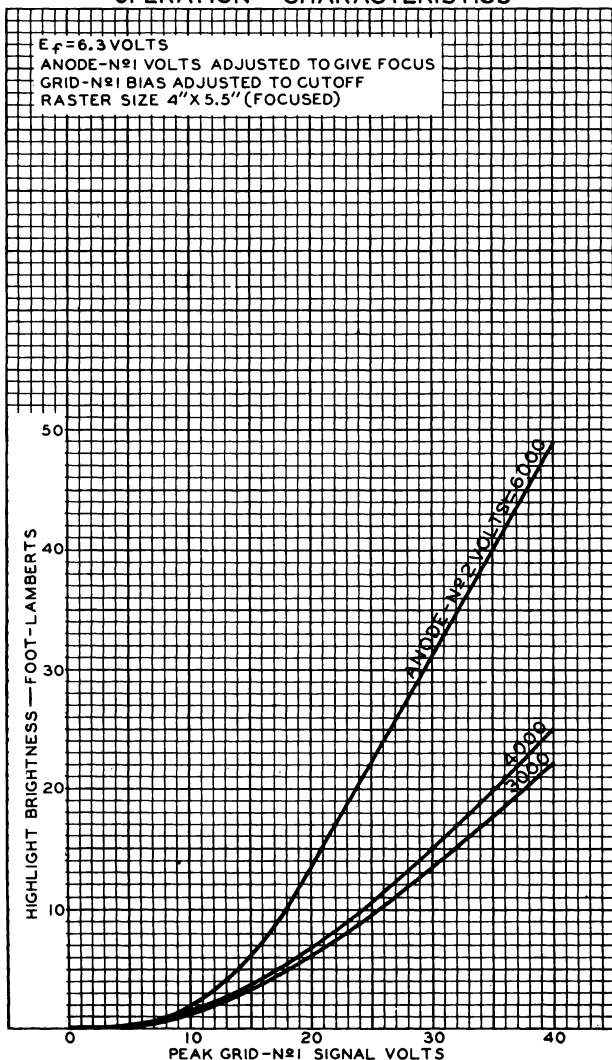
92CM-6890



7JP4

7JP4

OPERATION CHARACTERISTICS



AUG. 14, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6888



7MP7

7MP7

OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf Cathode to All Other Electrodes. 5 μf

Phosphor (For Curves, see front of this Section) P7

Fluorescence Blue

Phosphorescence. Greenish-Yellow

Persistence. Long

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 50°

Overall Length 12-3/4" $\pm$ 3/8"Greatest Diameter of Bulb. 7-3/16" $\pm$ 1/8"

Minimum Useful Screen Diameter 6"

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

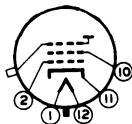
Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

BOTTOM VIEW

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2



Pin 11-Cathode

Pin 12-Heater

Cap -Grid No.3,
Collector

Maximum Ratings, Design-Center Values:*

Ultor[®] VOLTAGE 8000 max. volts

GRID-No.2 VOLTAGE:

Positive Value (DC or Peak AC) 700 max. volts

Negative Value (DC or Peak AC) 180 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 180 max. volts

Positive bias value[#] 0 max. volts

Positive peak value. 2 max. volts

PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. 125 max. volts

Heater positive with respect to cathode. 125 max. volts

- * In the 7M-types, grid No.3 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

- # At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.

7MP7



7MP7 OSCILLOGRAPH TUBE

Typical Operation:

Ultor Voltage*	4000	7000	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage °	-27 to -63	-27 to -63	volts
→ Grid-No.2 Current	-15 to +15	-15 to +15	μamp
→ Focusing-Coil Current (DC Approx.)**	64 ± 15%	85 ± 15%	ma
→ Spot Position	-	##	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 4000 volts.

° For visual extinction of undeflected, focused spot.

** For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with airgap toward faceplate and center line of air gap 2-3/4" from Reference Line (see Outline Drawing) and ultor current of 200 microamperes.

The center of the undeflected, unfocused spot will fall within a circle having 12-mm radius concentric with the center of the tube face.

→ Indicates a change

OCTOBER 1, 1951

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

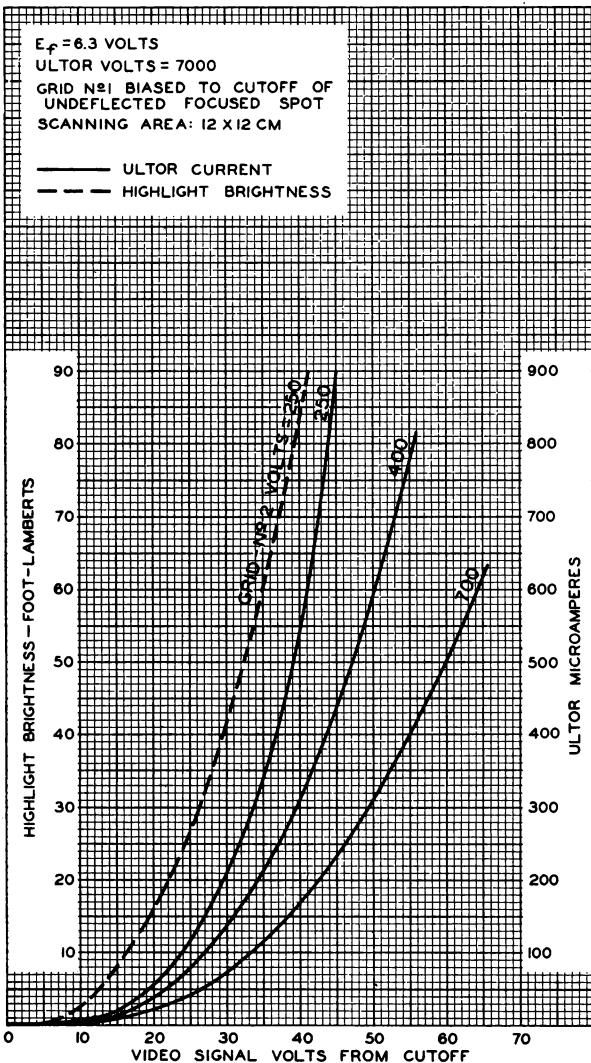


7MP7



7MP7

AVERAGE GRID-DRIVE CHARACTERISTICS



JULY 18, 1951

TUBE DEPARTMENT

92CM-7450RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



7MP14

7MP14

OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

The 7MP14 is the same as the 7MP7 except that it utilizes a medium-long-persistence, cascade (two-layer) screen which exhibits purple fluorescence of short persistence and orange phosphorescence which persists for a little over a minute under conditions of adequate excitation and ambient light.

Because of its medium-long-persistence, the 7MP14 is particularly useful where either low- and medium-speed non-recurring phenomena or high-speed recurring phenomena are to be observed. Furthermore, two or more phenomena can be observed simultaneously on the screen by means of a suitable switching arrangement.

The persistence is such that the 7MP14 without filter can be operated with scanning frequencies as low as 30 cycles per second without excessive flicker. When used with yellow filter, such as Wratten No. 15 (G), the 7MP14 can be operated with much lower scanning frequencies.

In general, operation of the 7MP14 at an ultor voltage below 4000 volts will not give persistence of useable brightness.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC
and the PERSISTENCE CHARACTERISTIC of
the P14 Phosphor are shown at the
front of this Section



7NP4

7NP4

PROJECTION KINESCOPE

METAL-BACKED FLUORESCENT SCREEN

FORCED-AIR COOLED

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.6 ac or dc volts ←

Current 0.62 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 12 μf Cathode to All Other Electrodes 6 μf

Phosphor (For Curves, see front

of this Section) . . . No.4—Silicate-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 35°

Overall Length 19-1/2" $\pm$ 5/8"Greatest Diameter of Bulb (Excluding Side Cap) . . . 7" $\pm$ 3/16"

Maximum Radius of Tube (Including Side Cap) 4-11/32"

Quality Rectangle of Face Plate

(See Outline Drawing) 5" x 3-3/4"

Cap. Medium

Mounting Position Any

Base Plastic-Filled, Small-Shell Diheptal 14-Pin

Basing Designation For BOTTOM VIEW 14N

Pin 1—Heater

Pin 2—Cathode

Pin 3—Grid No.1

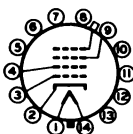
Pin 4—Grid No.2

Pin 5—No Conn.

Pin 6—No Conn.

Pin 7—No Conn.

Pin 8—No Conn.



Pin 9—Grid No.3

Pin 10—No Conn.

Pin 11—No Conn.

Pin 12—No Conn.

Pin 13—Int. Conn.—

Do Not Use

Pin 14—Heater

Cap—Anode

NOTE: Socket contacts for pins No.5, 6, 7, 8, 10, 11,

12, and 13 should be removed so that maximum

insulation is provided for pin No.9.

Air Flow to Face 40 cfm

The specified air flow should be delivered perpendicularly from a nozzle having a diameter of about 2 inches onto the face of the tube while it is in operation. The blower should have adequate capacity to provide for a total system pressure drop including that of the air filter.

Face Temperature 100 max. °C

CATHODE-DRIVE* SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Absolute Values:

ANODE-to-GRID-No.1 VOLTAGE°. 80000 max. volts

*, °: See next page

← indicates a change

JUNE 1, 1953

TUBE DEPARTMENT

TENTATIVE DATA 1

7NP4



7NP4

PROJECTION KINESCOPE

GRID-No.3-to-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.2-to-GRID-No.1 VOLTAGE	850 max.	volts
GRID-No.2-to-CATHODE VOLTAGE	600 max.	volts
CATHODE-to-GRID-No.1 VOLTAGE:		
Positive bias value.	250 max.	volts
Negative bias value.	0 max.	volts
Peak negative value.	2 max.	volts
AVERAGE ANODE CURRENT.	2 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts
Typical Operation:		
Anode-to-Grid-No.1 Voltage#.	75000	volts
Grid-No.3-to-Grid-No.1 Voltage	16000 - 18000	volts
Grid-No.2-to-Grid-No.1 Voltage		
for Pattern Cutoff.	400 - 600	volts
Cathode-to-Grid-No.1 Voltage	125	volts
Cathode-to-Grid-No.1 Video Voltage:		
Peak positive value (Black level).	0	volts
Peak negative value (White Level).	125	volts
Max. Grid-No.3 Current	15	μamp
Max. Grid-No.2 Current Range	-15 to +15	μamp

GRID-DRIVE** SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Absolute Values:

ANODE VOLTAGE ^o	80000 max.	volts
GRID-No.3 VOLTAGE.	20000 max.	volts
GRID-No.2 VOLTAGE.	600 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	250 max.	volts
Positive bias value.	0 max.	volts
Peak positive value.	2 max.	volts
AVERAGE ANODE CURRENT.	2 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

** Grid drive is the operating condition in which the video signal varies the grid-No.1 potential.

^o The product of anode-to-grid-No.1 voltage, or anode voltage, and average anode current should be limited to 160 watts.

* cathode drive is the operating condition in which the video signal varies the cathode potential.

#: See next page.

JUNE 1, 1953

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1



7NP4

7NP4

PROJECTION KINESCOPE

Typical Operation:

Anode Voltage#	75000	volts
Grid-No.3 Voltage.	16000 - 18000	volts
Grid-No.2 Voltage for Pattern Cutoff	400 - 600	volts
Grid-No.1 Voltage.	-155	volts
Grid-No.1 Video Voltage:		
Peak negative value (Black level).	0	volts
Peak positive value (White level).	155	volts
Max. Grid-No.3 Current	15	μ amp
Max. Grid-No.2 Current Range	-15 to +15	μ amp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max. megohms
--	------------------

Brilliance and definition decrease with decreasing anode-to-grid-No.1 voltage or anode voltage. In general, the anode-to-grid-No.1 voltage or the anode voltage should not be less than 70000 volts.

OPERATING NOTES

X-ray radiation is produced at the face of the 7NP4 when it is operated at its normal anode voltage. These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

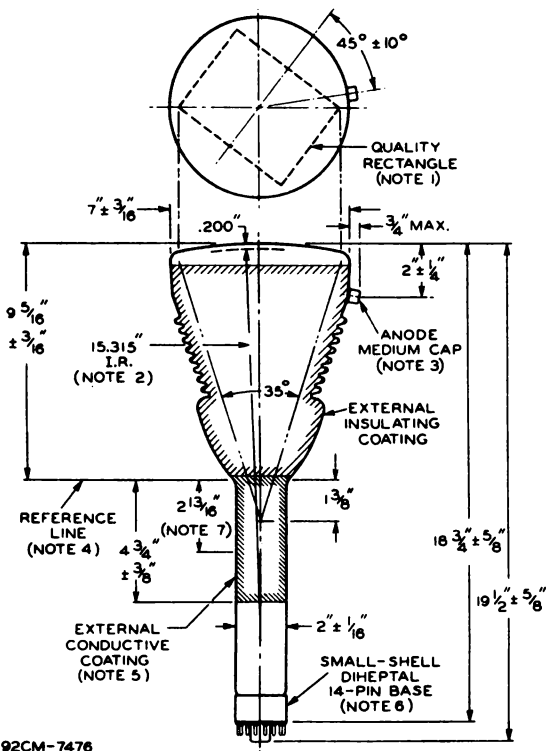
The air-cooling system required to cool the face of the 7NP4 consists of a blower and an air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. An air flow of 40 cubic feet per minute at the tube face is required to provide adequate cooling. In a typical system with air filter, the total system static pressure is approximately 0.25 inch of water. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the anode power supply to prevent operation of the tube without cooling.

Darkening of face occurs during normal operation of the 7NP4 with resulting decrease in the light transmitted by the face. The rate of darkening increases rapidly with increase in anode voltage, is proportional to the beam current, and is inversely proportional to the scanned area. The darkening develops rapidly during initial operation; thereafter, a gradual increase in the amount of darkening will be observed during the life of the tube. The darkening, however, can be decreased periodically throughout the life of the tube by bleaching the face as prescribed in the 7NP4 bulletin.



7NP4

PROJECTION KINESCOPE



NOTE 1: WHEN VIEWED FROM THE FACE OF THE TUBE, THE MINOR AXIS OF THE 5" x 3-3/4" QUALITY RECTANGLE IS LOCATED $45^{\circ} \pm 10^{\circ}$ IN A COUNTER-CLOCKWISE DIRECTION FROM A PLANE THROUGH THE ANODE TERMINAL AND THE TUBE AXIS.

NOTE 2: INSIDE SURFACE OF FACE PLATE WITHIN THE QUALITY RECTANGLE MAY VARY $\pm 0.006"$ FROM THE SPHERICAL SURFACE HAVING A $15.315"$ RADIUS.

NOTE 3: THE PLANE THROUGH BASE PIN No.9 AND THE TUBE AXIS MAY VARY FROM THE PLANE THROUGH THE ANODE TERMINAL AND THE TUBE AXIS BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . THE ANODE TERMINAL IS ON SAME SIDE AS PIN No.9.

NOV. 1, 1950

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7476A



7NP4

7NP4

PROJECTION KINESCOPE

NOTE 4: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" $\pm$.001" I.D. AND 3" LONG WILL REST ON BULB CONE.

NOTE 5: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 6: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS FOR PINS 5, 6, 7, 8, 10, 11, 12, AND 13 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PIN No.9.

NOTE 7: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

7NP4



7NP4

AVERAGE DRIVE CHARACTERISTICS

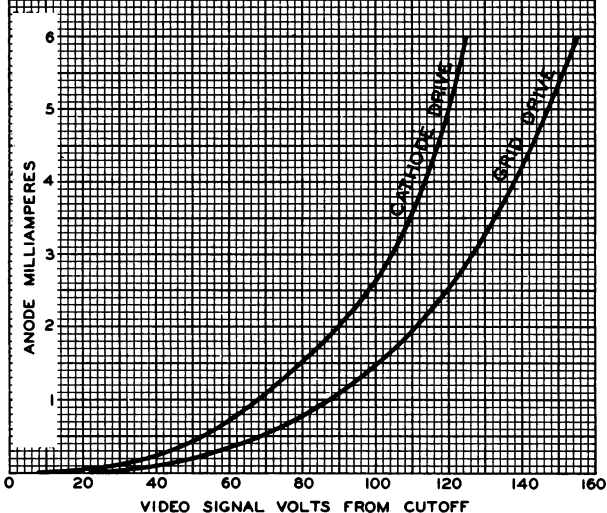
CATHODE-DRIVE SERVICE

 $E_f = 6.6$ VOLTSANODE-TO-GRID-N $\#$ 1 VOLTS =
70000-80000GRID-N $\#$ 3-TO-GRID-N $\#$ 1 VOLTS
ADJUSTED TO GIVE FOCUSGRID-N $\#$ 2-TO-GRID-N $\#$ 1 VOLTS
ADJUSTED TO PATTERN CUTOFFCATHODE BIASED POSITIVE
WITH RESPECT TO GRID
N $\#$ 1 (VOLTS) = 125

GRID-DRIVE SERVICE

 $E_f = 6.6$ VOLTS

ANODE VOLTS = 70000-80000

GRID N $\#$ 3 VOLTS ADJUSTED
TO GIVE FOCUSGRID N $\#$ 2 VOLTS ADJUSTED
TO PATTERN CUTOFFGRID-N $\#$ 1 BIAS VOLTS = -155

JULY 26, 1950

TUBE DEPARTMENT

92CM-7514

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



7NP4

7NP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

$E_f = 6.6$ VOLTS

ANODE-TO-GRID-N $\#$ 1 VOLTS = 75000

GRID-N $\#$ 3-TO-GRID-N $\#$ 1 VOLTS ADJUSTED TO GIVE FOCUS

GRID-N $\#$ 2-TO-GRID-N $\#$ 1 VOLTS ADJUSTED TO PATTERN CUTOFF

CATHODE BIASED POSITIVE WITH RESPECT TO GRID N $\#$ 1 (VOLTS) = 125

RASTER SIZE: $5 \times 3\frac{3}{4}$ "

GRID-DRIVE SERVICE

$E_f = 6.6$ VOLTS

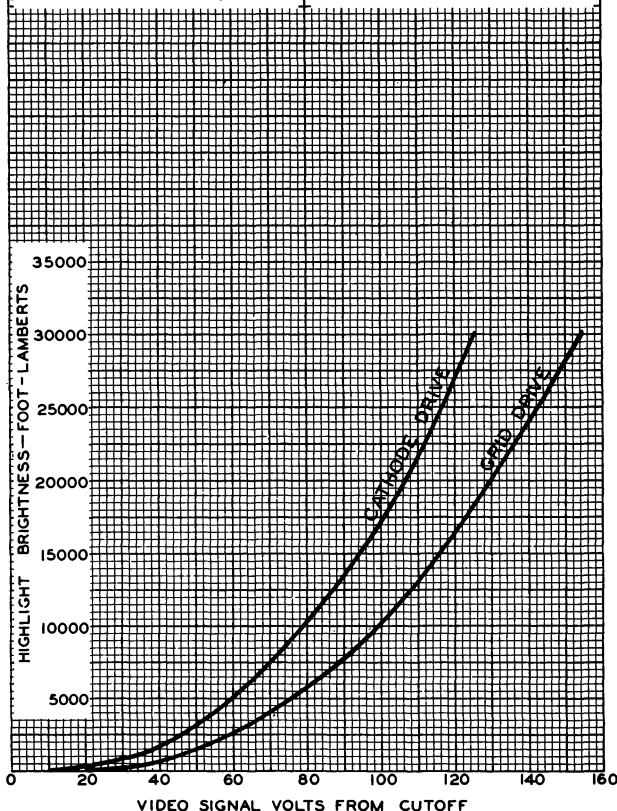
ANODE VOLTS = 75000

GRID-N $\#$ 3 VOLTS ADJUSTED TO GIVE FOCUS

GRID-N $\#$ 2 VOLTS ADJUSTED TO PATTERN CUTOFF

GRID-N $\#$ 1 BIAS VOLTS = -155

RASTER SIZE: $5 \times 3\frac{3}{4}$ "



7NP4



7NP4

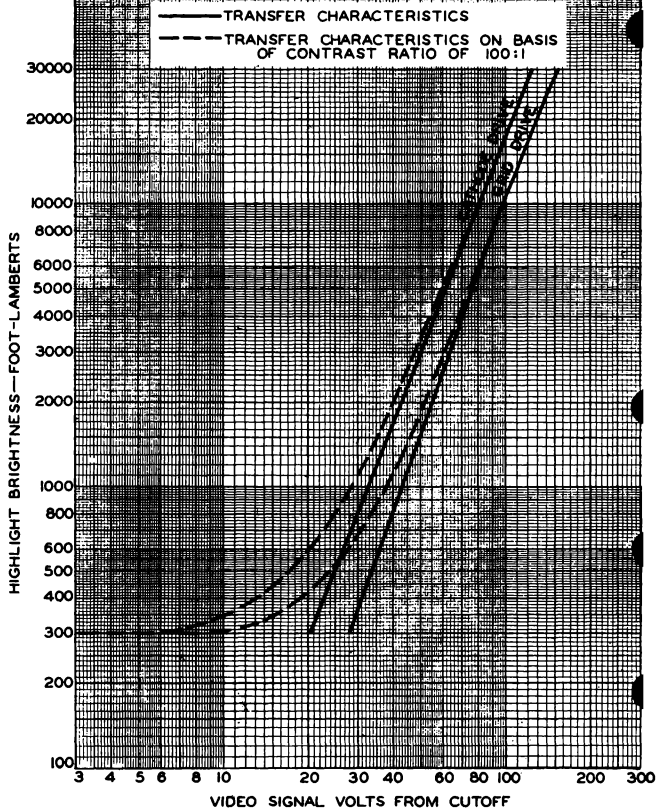
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

$E_f = 6.6$ VOLTS
 ANODE-TO-GRID-N^o1 VOLTS = 75000
 GRID-N^o3-TO-GRID-N^o1 VOLTS
 ADJUSTED TO GIVE FOCUS
 GRID-N^o2-TO-GRID-N^o1 VOLTS
 ADJUSTED TO PATTERN
 CUTOFF
 CATHODE BIASED POSITIVE
 WITH RESPECT TO GRID
 N^o1 (VOLTS) = 125
 RASTER SIZE: $5" \times 3\frac{3}{4}"$

GRID-DRIVE SERVICE

$E_f = 6.6$ VOLTS
 ANODE VOLTS = 75000
 GRID-N^o3 VOLTS ADJUSTED
 TO GIVE FOCUS
 GRID-N^o2 VOLTS ADJUSTED
 TO PATTERN CUTOFF
 GRID-N^o1 BIAS VOLTS = -155
 RASTER SIZE: $5" \times 3\frac{3}{4}"$



JULY 28, 1950

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-7519



7QP4

7QP4

MONITOR KINESCOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA**General:**

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf Cathode to All Other Electrodes. 5 μf

Phosphor (For Curves, See front of this Section). No.4-Sulfide Type

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 52°

Ion-Trap Gun Requires External, Single-Field Magnet

Overall Length $12-7/8" \pm 3/8"$ Greatest Diameter of Bulb. $7-3/16" \pm 1/8"$ Screen Diameter. $6-1/4"$

Mounting Position. Any

Cap. Recessed Small Cavity

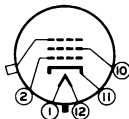
Base Small-Shell Duodecal 5-Pin

BOTTOM VIEW

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2



Pin 11-Cathode

Pin 12-Heater

Cap - Anode

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE* 10000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period 150 max. volts

Heater positive with respect to cathode. 150 max. volts

Typical Operation:

Anode Voltage*. 8000 . . volts

* The product of anode voltage and average anode current should be limited to 6 watts.

** Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 6000 volts.

JAN. 1, 1951

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7QP4



7QP4

MONITOR KINESCOPE

Grid-No.2 Voltage.	300	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot . .	-33 to -77	volts
Focusing-Coil Current (DC, approx.)# . . .	80	ma
Field Strength of Single-Field Ion-Trap Magnet ^o	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-Circuit Resistance	11000 min.	ohms

The resistors used should be capable of withstanding the applied voltage.

For specimen focusing coil similar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference Line (see *Outline Drawing*). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 40 foot-lamberts on a 5-3/8" x 4" picture area sharply focused at center of screen.

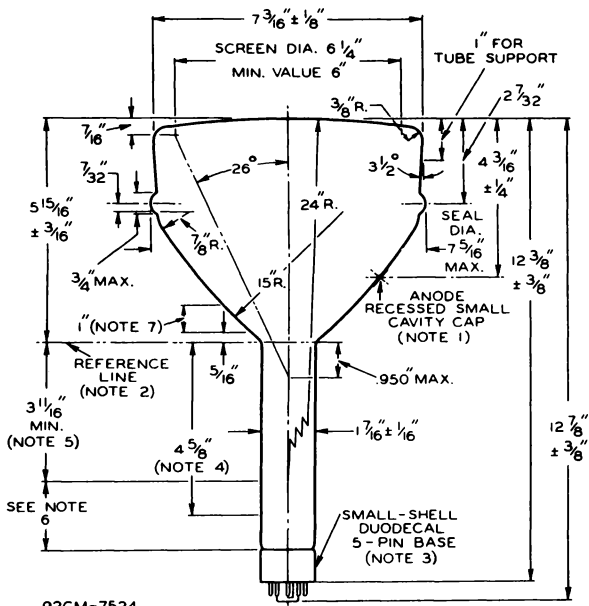
^o Measured at center of field with General Electric Gauss Meter, Cat. No.409X51.



7QP4

7QP4

MONITOR KINESCOPE



92CM-7524

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE $1.500'' + .003'' - .000''$ I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF $1\frac{7}{8}''$.

NOTE 4: DISTANCE FROM REFERENCE LINE FOR LOCATING CENTER OF ION-TRAP MAGNETIC FIELD. DIRECTION OF FIELD OF THE ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.8 AND SOUTH POLE TO PIN No.2.

7QP4



7QP4

MONITOR KINESCOPE

NOTE 5: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.

NOTE 6: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET.

NOTE 7: FOR TUBE SUPPORT WHICH MUST BE KEPT AT LEAST 2" AWAY FROM ANODE CAVITY CAP.

JAN. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

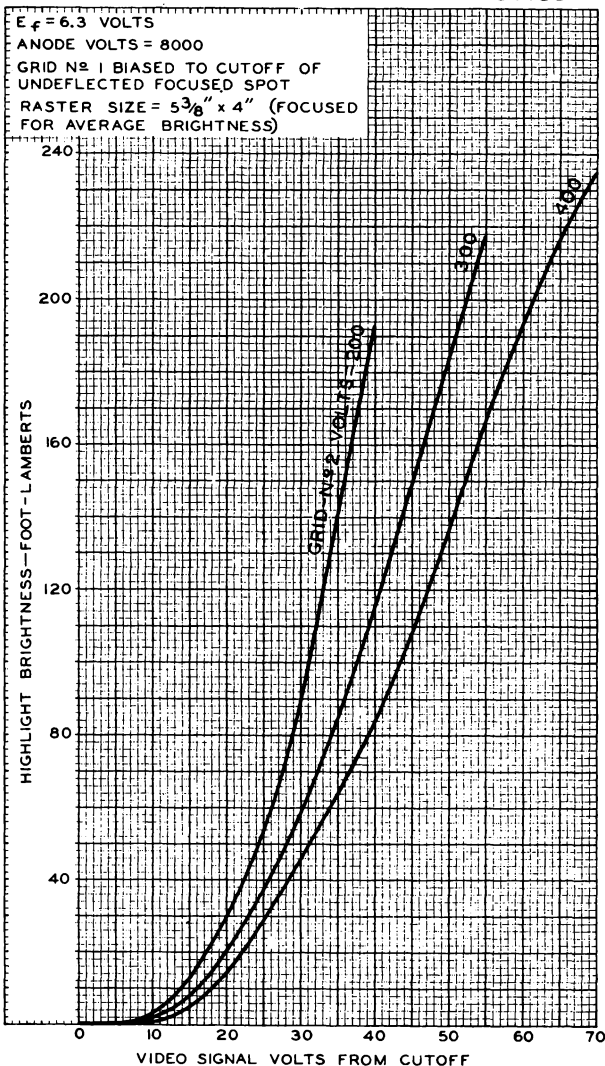
CE-7524B



7QP4

7QP4

AVERAGE GRID-DRIVE CHARACTERISTICS



AUGUST 22, 1950

TUBE DEPARTMENT

92CM-7529

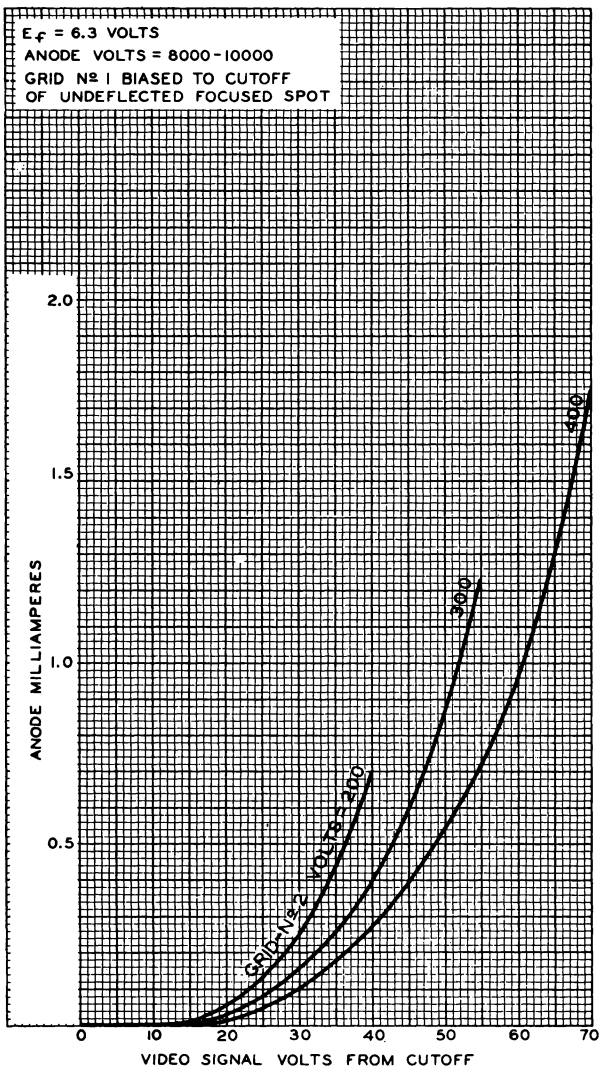
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7QP4



7QP4

AVERAGE GRID-DRIVE CHARACTERISTICS





7TP4

7TP4 MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 6 $\mu\mu\text{f}$
Cathode to All Other Electrodes 5 $\mu\mu\text{f}$

Faceplate Clear Glass

Phosphor, Metal-Backed^o P4—Sulfide Type

Fluorescence and Phosphorescence. White

Persistence of Phosphorescence. Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.). 50°

Overall Length. 13-1/8" $\pm$ 3/8"Greatest Diameter of Bulb 7-3/16" $\pm$ 1/8"

Minimum Useful Screen Diameter. 6"

Picture Size (Within minimum-useful-screen area) 5-3/8" x 4"

Cap Recessed Small Cavity (JETEC No. J1-21)

Base. Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

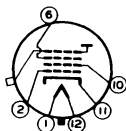
Pin 1 - Heater

Pin 2 - Grid No.1

Pin 6 - Grid No.3

Pin 10 - Grid No.2

Pin 11 - Cathode



Pin 12 - Heater

Cap - Grid No.4,
Collector
(Ultor)

Maximum Ratings, Design-Center Values:

ULTOR^o VOLTAGE. 12000 max. volts

GRID-No.3 VOLTAGE 2000 max. volts

GRID-No.2 VOLTAGE 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

^o For curves, see front of this Section.

• In the 7TP4, grid No.4 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

7TP4



7TP4 MONITOR KINESCOPE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds 410 max. volts

After equipment warm-up period. . . 180 max. volts

Heater positive with respect to cathode. 180 max. volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 10000* and 12000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 410 volts

Grid-No.3 Voltage for Focus with

Ultor Current of 100 μ amp. . . 11.6% to 15.8% of E_u volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot. 11% to 25.7% of E_{c2} volts

Grid-No.3 Current**.

See Curves

Grid-No.2 Current.

-15 to +15 μ amp

Field Strength of Adjustable

Centering Magnet. 0 to 8 gauss

Examples of Use of Design Ranges:

For ultor voltage of 10000 volts
and grid-No.2 voltage of 200 volts

Grid-No.3 Voltage for Focus with

Ultor Current of 100 μ amp. . . 1160 to 1580 volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot. -22 to -52 volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.

** Grid-No.3 Current increases as the ultor voltage is decreased.



7TP4

7 $\frac{3}{16}$ " $\pm$ $\frac{1}{8}$ "
 6" MIN. USEFUL SCREEN DIA.
 1" FOR TUBE SUPPORT
 2 $\frac{7}{32}$ "
 3 $\frac{1}{8}$ " R.
 3 $\frac{1}{2}$ "
 4 $\frac{3}{16}$ "
 $\pm$ $\frac{1}{4}$ "
 SEAL DIA.
 -7 $\frac{5}{16}$ " MAX.
 GRID N $\circ$ 4, COLLECTOR RECESSED SMALL CAVITY CAP JETEC N $\circ$ JI-21 (NOTE 1)
 REFERENCE LINE (NOTE 2)
 950" MAX.
 1 $\frac{7}{16}$ " $\pm$ $\frac{1}{16}$ "
 7 $\frac{3}{16}$ " $\pm$ $\frac{3}{16}$ "
 13 $\frac{1}{8}$ " $\pm$ $\frac{3}{8}$ "
 25°
 24" R.
 15" R. APPROX.
 3 $\frac{1}{4}$ " MAX.
 5 $\frac{15}{16}$ " $\pm$ $\frac{3}{16}$ "
 7 $\frac{3}{16}$ " $\pm$ $\frac{1}{8}$ "
 SMALL-SHELL DUODECAL 6-PIN BASE JETEC N $\circ$ B6-63 (NOTE 3)

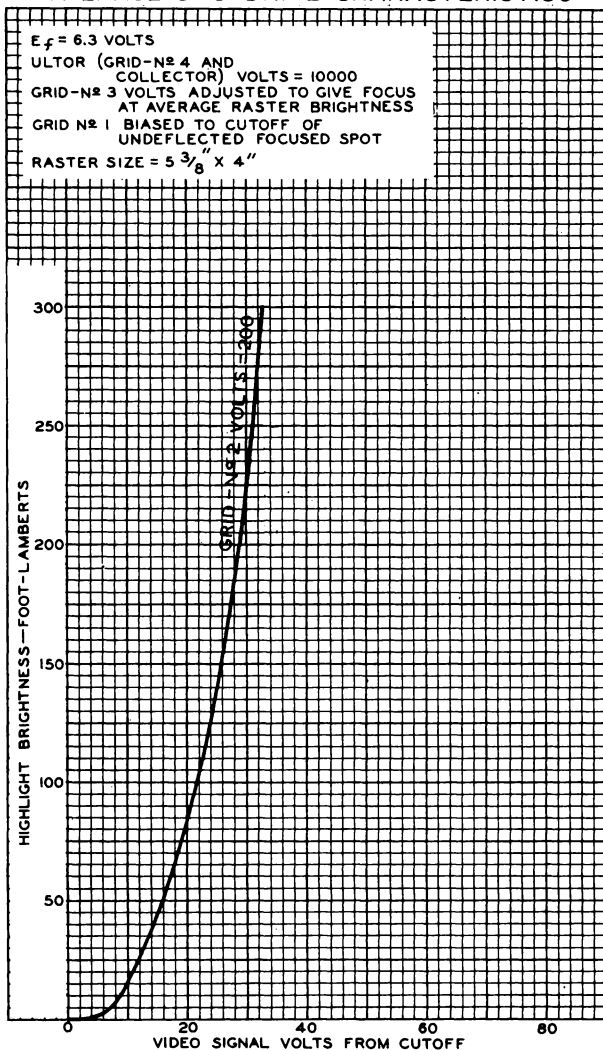
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

7TP4



7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 3, 1951

 TUBE DEPARTMENT
 RADIC CORPORATION OF AMERICA, HARRISON, NEW JERSEY

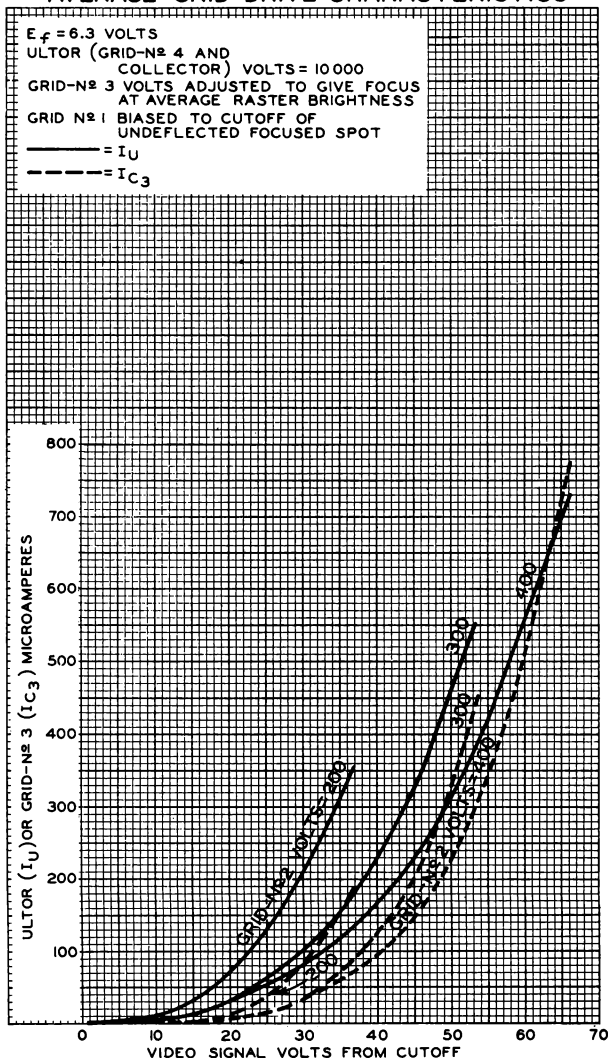
92CM-7667



7TP4

7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 3, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7688



7VP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 6 $\mu\mu\text{f}$ DJ₁ to DJ₂ 3 $\mu\mu\text{f}$ DJ₃ to DJ₄ 2 $\mu\mu\text{f}$ DJ₁ to All Other Electrodes 9 $\mu\mu\text{f}$ DJ₂ to All Other Electrodes 9 $\mu\mu\text{f}$ DJ₃ to All Other Electrodes 7 $\mu\mu\text{f}$ DJ₄ to All Other Electrodes 7 $\mu\mu\text{f}$

Faceplate Clear Glass

Phosphor (For Curves, see front of this Section) P1

Fluorescence and Phosphorescence Green

Persistence of Phosphorescence Medium

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 14-1/2" $\pm$ 3/8"Greatest Diameter of Bulb 7" $\pm$ 1/8"

Minimum Useful Screen Diameter 6"

Mounting Position Any

Bulb J56H

Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)

BOTTOM VIEW

Pin 1-Heater

Pin 2-Cathode

Pin 3-Grid No.1

Pin 4-No

Connection

Pin 5-Grid No.3

Pin 7-Deflecting

Electrode

DJ₃

Pin 8-Deflecting

Electrode

DJ₄

Pin 9-Ultor*

(Grid No.2,

Grid No.4,

Collector)

Pin 10-Deflecting

Elect. DJ₂

Pin 11-Deflecting

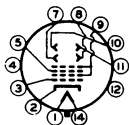
Elect. DJ₁

Pin 12-Internal

Connection-

Do Not Use

Pin 14-Heater

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 5. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 2.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ₁ and DJ₂ by an angular tolerance (measured about the tube axis) of $\pm 10^\circ$. Angle between DJ₁-DJ₂ trace and DJ₃-DJ₄ trace is $90^\circ \pm 3^\circ$.

* : See next page.

NOV. 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7VP1



7VP1

OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE	4000 max.	volts
GRID-No.3 VOLTAGE	2000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value*	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	750 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	125 max.	volts
Heater positive with respect to cathode .	125 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 1000# and 4000 volts

Grid-No.3 Voltage for Focus	27% to 40% of E_u	volts
Maximum Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	2.8% of E_u	volts
Grid-No.3 Current	-15 to +10	μ amp
Deflection Factors:		
DJ ₁ & DJ ₂	31 to 41	v dc/in./kv of E_u
DJ ₃ & DJ ₄	25 to 34	v dc/in./kv of E_u
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of	1500	3000	volts
Grid-No.3 Voltage for Focus	400 to 600	800 to 1200	volts
Maximum Grid-No.1 Volt- age for Visual Extinc- tion of Undelected Focused Spot	-42	-84	volts
Deflection Factors:			
DJ ₁ & DJ ₂	47 to 62	93 to 123	volts dc/in.
DJ ₃ & DJ ₄	38 to 51	75 to 102	volts dc/in.

Maximum Circuit Values:

Grid No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting- Electrode Circuit ⁰	5.0 max.	megohms

* In the 7VP1, grid No.4 which has the ultor function, grid No.2, and col-lector are connected together within the tube and are conveniently re-ferred to collectively as "ultor." The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

⁰ At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.

#, ##, ⁰: See next page.

NOV. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1



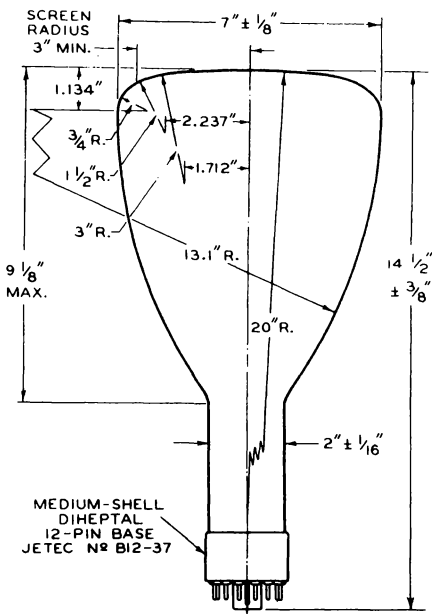
7VP1

7VP1

OSCILLOGRAPH TUBE

- # Brilliance and definition decrease with decreasing ultor voltage. A value as low as 1000 volts is recommended only for low-velocity deflection and low ambient-light levels.
- ## With ultor voltage of 1500 volts, the center of the undeflected focused spot will fall within a circle having a 10-mm radius concentric with the center of the tube face.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

The 7VP1 can be used as a direct replacement for the 7JP1 in all equipment where the high-voltage supply does not provide more than 4000 volts.



92CM-6667R1

⊥ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

7VPI

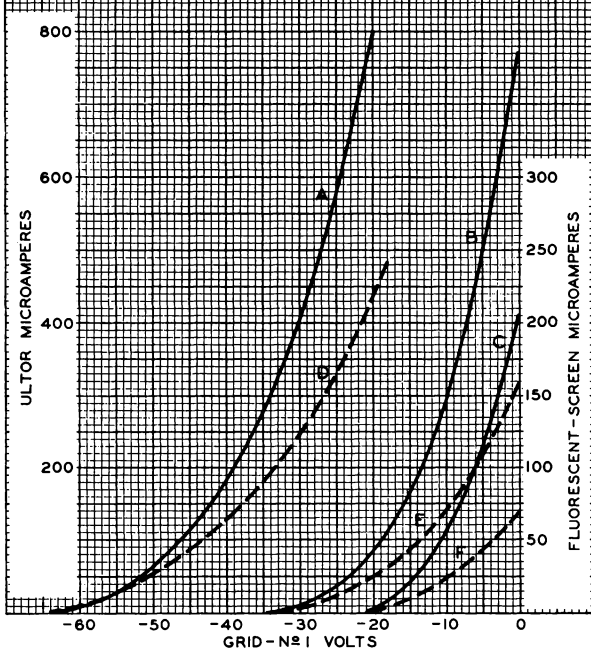


7VPI

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTSGRID - N₂ 3 VOLTS ADJUSTED FOR FOCUS

CURVE	CURRENT	ULTOR VOLTS
A	ULTOR	3000
B	ULTOR	1500
C	ULTOR	1000
D	FLUORESCENT SCREEN	3000
E	FLUORESCENT SCREEN	1500
F	FLUORESCENT SCREEN	1000



DEC. 17, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISBURG, NEW JERSEY

92CM - 7721



7WP4

7WP4

PROJECTION KINESCOPE

METAL-BACKED FLUORESCENT SCREEN

FORCED-AIR COOLED

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA**General:**

Heater, for Unipotential Cathode:

Voltage $6.6 \pm 5\%$ ac or dc volts

Current 0.62 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 12 μf Cathode to All Other Electrodes 6 μf

Phosphor (For Curves, see front

of this Section) P4—Silicate-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 35° Overall Length $19-7/16" \pm 5/8"$ Greatest Diameter of Bulb (Excluding Side Cap) $7" \pm 3/16"$ Maximum Radius of Tube (Including Side Cap) $4-11/32"$

Quality Rectangle of Faceplate

(See Outline Drawing) $5" \times 3-3/4"$

Refractive Index for Faceplate Glass 1.469

Cap Medium (JETEC No.C1-5)

Mounting Position Any

Base Plastic-Filled, Small-Shell Diheptal 14-Pin

(JETEC No.B14-45)

BOTTOM VIEW

Pin 1—Heater

Pin 2—Cathode

Pin 3—Grid No.1

Pin 4—Grid No.2

Pin 5—No Conn.

Pin 6—No Conn.

Pin 7—No Conn.

Pin 8—No Conn.

Pin 9—Grid No.3



Pin 10—No Conn.

Pin 11—No Conn.

Pin 12—No Conn.

Pin 13—Int. Conn.—

Do Not Use

Pin 14—Heater

Cap—Ultor

(Grid No.4,

Collector)

NOTE: Socket Contacts for pins No.5, 6, 7, 8, 10, 11,

12, and 13 should be removed so that maximum

insulation is provided for pin No.9.

Air Flow to Face 40 cfm

The specified air flow should be delivered perpendicularly from a nozzle having a diameter of about 2 inches onto the face of the tube while it is in operation. The blower should have adequate capacity to provide for a total system pressure drop including that of the air filter.

Face Temperature 100 max. $^\circ\text{C}$

JULY 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7WP4



7WP4

PROJECTION KINESCOPE

CATHODE-DRIVE* SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Absolute Values:

ULTOR®-to-GRID-No.1 VOLTAGE ^o	80000 max.	volts
GRID-No.3-to-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.2-to-GRID-No.1 VOLTAGE	850 max.	volts
GRID-No.2-to-CATHODE VOLTAGE	600 max.	volts

CATHODE-to-GRID-No.1 VOLTAGE:

Positive bias value	250 max.	volts
Negative bias value	0 max.	volts
Peak negative value	2 max.	volts

AVERAGE ULTOR CURRENT	2 max.	ma
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PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds	410 max.	volts
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After equipment warm-up period	150 max.	volts
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Heater positive with respect to cathode.	150 max.	volts
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Typical Operation:

Ultor-to-Grid-No.1 Voltage#	75000	volts
Grid-No.3-to-Grid-No.1 Voltage	16000 - 18000	volts
Grid-No.2-to-Grid-No.1 Voltage		
for Pattern Cutoff	400 - 600	volts
Cathode-to-Grid-No.1 Voltage	125	volts
Cathode-to-Grid-No.1 Video Voltage:		
Peak positive value (Black level).	0	volts
Peak negative value (White level).	125	volts
Max. Grid-No.3 Current	15	μamp
Max. Grid-No.2 Current Range	-15 to +15	μamp

GRID-DRIVE** SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Absolute Values:

ULTOR® VOLTAGE ^o	80000 max.	volts
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* In the 7WP4, grid No.4 which has the ultor function and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

* Cathode drive is the operating condition in which the video signal varies the cathode potential.

** Grid drive is the operating condition in which the video signal varies the grid-No.1 potential.

^o The product of ultor-to-grid-No.1 voltage, or ultor voltage, and average ultor current should be limited to 160 watts.

See next page.



7WP4

7WP4

PROJECTION KINESCOPE

GRID-No.3 VOLTAGE	20000 max.	volts
GRID-No.2 VOLTAGE	600 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	250 max.	volts
Positive bias value	0 max.	volts
Peak positive value	2 max.	volts
AVERAGE ULTOR CURRENT	2 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Typical Operation:

Ultror Voltage#	75000	volts
Grid-No.3 Voltage	16000 - 18000	volts
Grid-No.2 Voltage for Pattern Cutoff	400 - 600	volts
Grid-No.1 Voltage	-155	volts
Grid-No.1 Video Voltage:		
Peak negative value (Black level)	0	volts
Peak positive value (White level)	155	volts
Max. Grid-No.3 Current	15	μ amp
Max. Grid-No.2 Current Range	-15 to +15	μ amp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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* Brilliance and definition decrease with decreasing ultor-to-grid-No.1 voltage or ultor voltage. In general, the ultor-to-grid-No.1 voltage or the ultor voltage should not be less than 70000 volts.

OPERATING NOTES

X-ray radiation is produced at the face of the 7WP4 when it is operated at its normal ultor voltage. For x-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section.

The air-cooling system required to cool the face of the 7WP4 consists of a blower and an air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. An air flow of 40 cubic feet per minute at the tube face is required to provide adequate cooling. In a typical system with air filter, the total system static pressure is approximately 0.25 inch of water. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the ultor power supply to prevent operation of the tube without cooling.

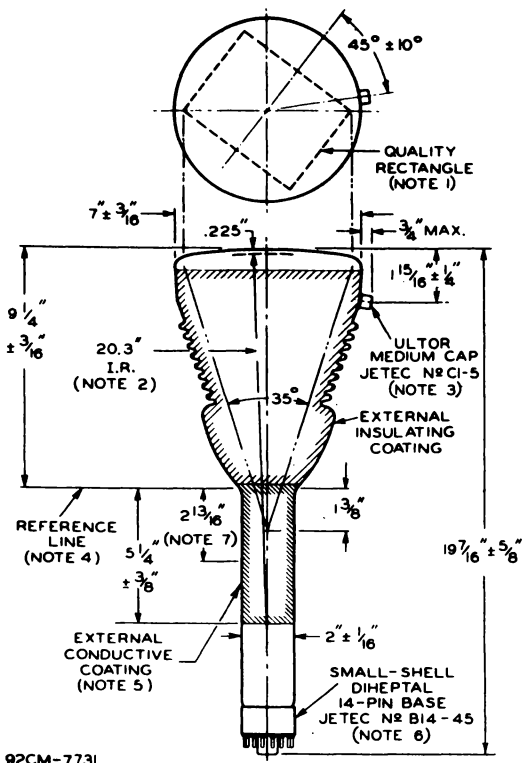


7WP4

PROJECTION KINESCOPE

OPERATING NOTES (Cont'd)

Darkening of face occurs during normal operation of the 7WP4 with resulting decrease in the light transmitted by the face. The rate of darkening increases rapidly with increase in ulior voltage, is proportional to the beam current, and is inversely proportional to the scanned area. The darkening develops rapidly during initial operation; thereafter, a gradual increase in the amount of darkening will be observed during the life of the tube. The darkening, however, can be decreased periodically throughout the life of the tube by bleaching the face as prescribed in the bulletin.



92CM-7731

JULY 1, 1952

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 2



7WP4

7WP4

PROJECTION KINESCOPE

NOTE 1: WHEN VIEWED FROM THE FACE OF THE TUBE, THE MINOR AXIS OF THE 5" x 3-3/4" QUALITY RECTANGLE IS LOCATED $45^{\circ} \pm 10^{\circ}$ IN A COUNTER-CLOCKWISE DIRECTION FROM A PLANE THROUGH THE ULTOR TERMINAL AND THE TUBE AXIS.

NOTE 2: INSIDE SURFACE OF FACEPLATE WITHIN THE QUALITY RECTANGLE MAY VARY ± 0.006 " FROM THE SPHERICAL SURFACE HAVING A 20.3" RADIUS.

NOTE 3: THE PLANE THROUGH BASE PIN No.9 AND THE TUBE AXIS MAY VARY FROM THE PLANE THROUGH THE ULTOR TERMINAL AND THE TUBE AXIS BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . THE ULTOR TERMINAL IS ON SAME SIDE AS PIN No.9.

NOTE 4: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" $\pm$ 0.001" I.D. AND 3" LONG WILL REST ON BULB CONE.

NOTE 5: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 6: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS FOR PINS 6, 7, 8, 10, 11, 12, AND 13 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PIN No.9.

NOTE 7: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

7WP4



7WP4

AVERAGE DRIVE CHARACTERISTICS

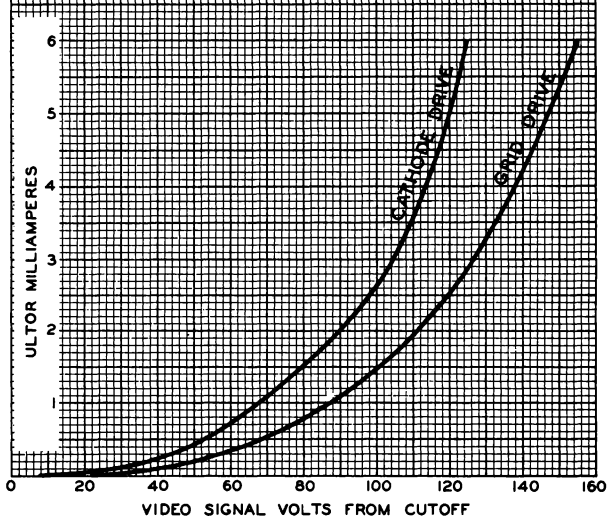
CATHODE-DRIVE SERVICE

 $E_f = 6.6$ VOLTSULTOR - TO - GRID-N $\#$ 1 VOLTS =
70000-80000GRID-N $\#$ 3 - TO - GRID-N $\#$ 1 VOLTS
ADJUSTED TO GIVE FOCUSGRID-N $\#$ 2 - TO - GRID-N $\#$ 1 VOLTS
ADJUSTED TO PATTERN CUTOFFCATHODE BIASED POSITIVE
WITH RESPECT TO GRID
N $\#$ 1 (VOLTS) = 125

GRID-DRIVE SERVICE

 $E_f = 6.6$ VOLTS

ULTOR VOLTS = 70000-80000

GRID N $\#$ 3 VOLTS ADJUSTED
TO GIVE FOCUSGRID N $\#$ 2 VOLTS ADJUSTED
TO PATTERN CUTOFFGRID-N $\#$ 1 BIAS VOLTS = -155

JULY 26, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7514



7WP4

7WP4

AVERAGE DRIVE CHARACTERISTICS

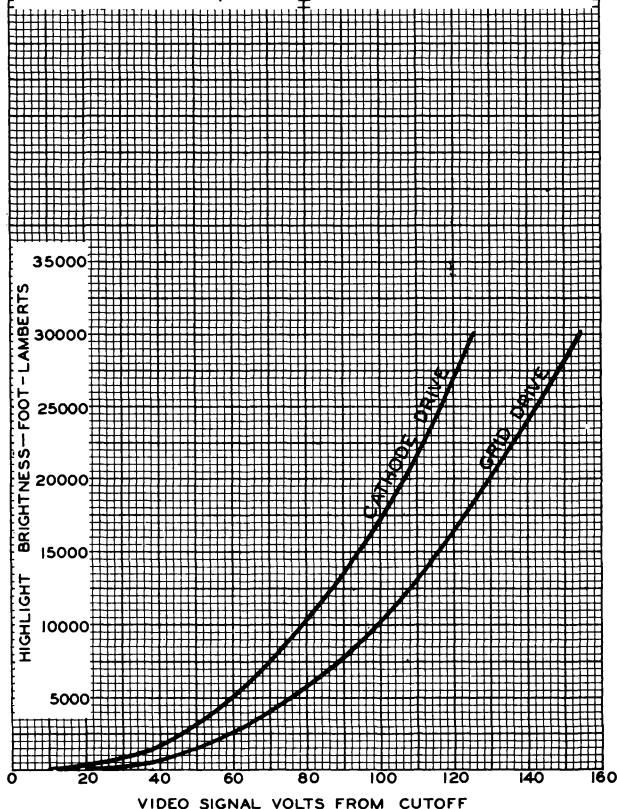
CATHODE - DRIVE SERVICE

 $E_f = 6.6$ VOLTSULTOR-TO-GRID-N $\approx$ 1 VOLTS=
75000GRID-N $\approx$ 3-TO-GRID-N $\approx$ 1 VOLTS
ADJUSTED TO GIVE FOCUSGRID-N $\approx$ 2-TO-GRID-N $\approx$ 1 VOLTS
ADJUSTED TO PATTERN CUTOFFCATHODE BIASED POSITIVE
WITH RESPECT TO GRID
N $\approx$ 1 (VOLTS) = 125RASTER SIZE: 5" x 3 $\frac{3}{4}$ "

GRID-DRIVE SERVICE

 $E_f = 6.6$ VOLTS

ULTOR VOLTS = 75000

GRID-N $\approx$ 3 VOLTS ADJUSTED
TO GIVE FOCUSGRID-N $\approx$ 2 VOLTS ADJUSTED
TO PATTERN CUTOFFGRID-N $\approx$ 1 BIAS VOLTS = -155RASTER SIZE: 5" x 3 $\frac{3}{4}$ "

JULY 26, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7515

TWP4



7WP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

$E_f = 6.6$ VOLTS

ULTOR-TO-GRID-N $\#$ 1 VOLTS = 75000

GRID-N $\#$ 3-TO-GRID-N $\#$ 1 VOLTS ADJUSTED TO GIVE FOCUS

GRID-N $\#$ 2-TO-GRID-N $\#$ 1 VOLTS ADJUSTED TO PATTERN CUTOFF

CATHODE BIASED POSITIVE WITH RESPECT TO GRID N $\#$ 1 (VOLTS) = 125

RASTER SIZE: 5" x 3 3/4"

GRID-DRIVE SERVICE

$E_f = 6.6$ VOLTS

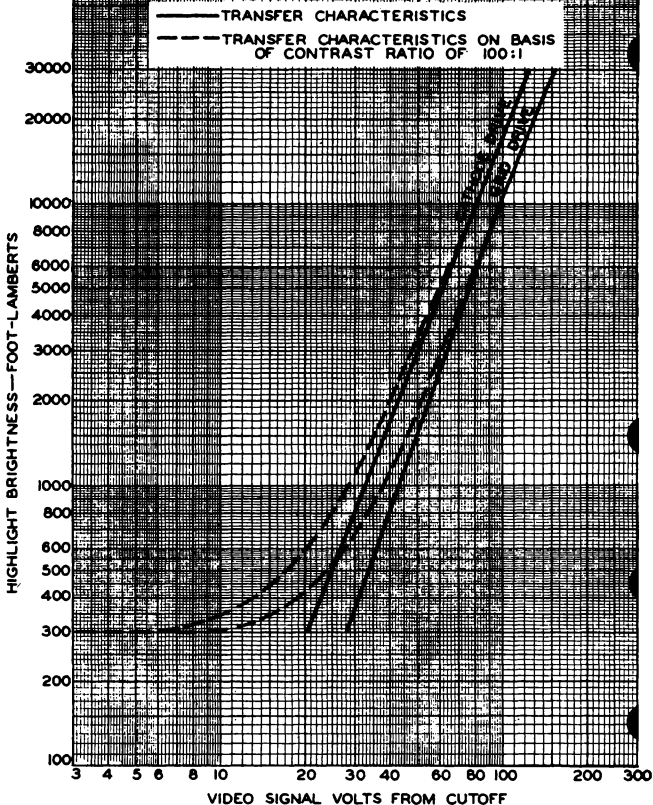
ULTOR VOLTS = 75000

GRID-N $\#$ 3 VOLTS ADJUSTED TO GIVE FOCUS

GRID-N $\#$ 2 VOLTS ADJUSTED TO PATTERN CUTOFF

GRID-N $\#$ 1 BIAS VOLTS = -155

RASTER SIZE: 5" x 3 3/4"



JULY 28, 1950

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-7519



8DP4

KINESCOPE

SMALL, COMPACT, RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

8DP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf Cathode to all other electrodes 5 μf External conductive coating to ultor. $\begin{cases} 350 \text{ max.} \\ 250 \text{ min.} \end{cases}$ μf

Faceplate, Spherical. Filterglass

Light transmission (Approx.). 80%

Phosphor (For Curves, see front of this section). .P4—Sulfide Type

Fluorescence. White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal. 90° Horizontal. 85° Vertical. 68°

Ion-Trap Gun. Requires External Single-Field Magnet

Tube Dimensions:

Overall length. $10-7/16" \pm 5/16"$ Greatest width. $7-7/8" + 1/16" - 1/32"$ Greatest height $6-1/16" + 1/16" - 1/32"$ Diagonal. $8-7/16" + 1/16" - 1/32"$ Neck length $6-1/2" \pm 3/16"$

Screen Dimensions (Minimum):

Greatest width. $7-3/16"$ Greatest height $5-3/8"$ Diagonal. $7-13/16"$

Projected area. 35.5 sq. in.

Weight (Approx.). 3 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No. J1-21)

Bulb. J67-1/2

Base. Dwarf-Shell Duodecal 6-Pin (JETEC No. B6-158)

Basing Designation for BOTTOM VIEW. 12AB

Pin 1—Heater

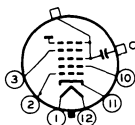
Pin 2—Grid No.1

Pin 3—Grid No.4

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,

Grid No.5,

Collector)

C—External
Conductive
Coating



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GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	8000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	500 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	300 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value.	130 max.	volts
Negative bias value.	100 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 4000 and 8000 volts and grid-No.2 voltage (E_{c2k}) between 85 and 300 volts*

Grid-No.4 Voltage Required for Focus:

Changes directly with E_{c5k} at the rate of approximately 30 volts for each 1000-volt change in E_{c5k} .

Changes inversely with E_{c2k} at the rate of approximately 25 volts for each 100-volt change in E_{c2k} .

Changes inversely with ultor current at the rate of approximately 22.5 volts for each 50- μ amp change in ultor current.

For typical values, see *Examples of Use of Design Ranges*.

Grid-No.1 Voltage (E_{c1k}) for

Visual Extinction of

Focused Raster See Cutoff Design Chart for Grid-Drive Service

Grid-No.1 Video Drive from

Raster Cutoff

(Black Level):

White-level value

(Peak positive). Same value as determined for E_{c1k} except video drive is positive voltage

Grid-No.4 Current. -25 to +25 μ amp

Grid-No.2 Current. -15 to +15 μ amp

Ion-Trap Magnet Current

(Average)** $\sqrt{E_{c5k}/8000} \times 32$ ma

Minimum Field Strength of

PM Ion-Trap Magnet§. $\sqrt{E_{c5k}/8000} \times 36$ gaussess

Field Strength of Adjustable Centering Magnet. 0 to 5 gaussess

▲, #, **, §: See next page.



8DP4

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8DP4

Examples of Use of Design Ranges:

With ultor voltage of	6000	8000	volts
and grid-No. 2 voltage of	150	200	volts
Grid-No. 4 Voltage for Focus with Ultor			
Current of 100 μ amp	+15 to +315	+60 to +360	volts
Grid-No. 1 Voltage for Visual Extinction of Focused Raster.	-13 to -35	-17 to -46	volts
Grid-No. 1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	13 to 35	17 to 46	volts
Minimum Field Strength of PM Ion-Trap Magnet.	31	36	gausses

Maximum Circuit Values:

Grid-No. 1-Circuit Resistance.	1.5 max.	megohms
--	----------	---------

CATHODE-DRIVE[■] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No. 1*

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No. 1 VOLTAGE.	8000 max.	volts
GRID-No. 4-TO-GRID-No. 1 VOLTAGE:		
Positive value.	500 max.	volts
Negative value.	500 max.	volts
GRID-No. 2-TO-GRID-No. 1 VOLTAGE.	400 max.	volts
CATHODE-TO-GRID-No. 1 VOLTAGE:		
Positive peak value	130 max.	volts
Positive bias value	100 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

▲ Grid drive is the operating condition in which the video signal varies the grid-No. 1 potential with respect to cathode.

Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No. 1 voltage. In general, the ultor voltage or ultor-to-grid-No. 1 voltage should not be less than 4000 volts.

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No. 1 and the other electrodes.

**§: See next page.



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Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 4000* and 8000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 100 and 400 volts

Grid-No.4-to-Grid-No.1

Voltage Required for Focus:

Changes directly with E_{c5g1} at the rate of approximately 30 volts for each 1000-volt change in E_{c5g1} .

Changes inversely with E_{c2g1} at the rate of approximately 25 volts for each 100-volt change in E_{c2g1} .

Changes inversely with ultor current at the rate of approximately 22.5 volts for each 50- μ amp change in ultor current.

For typical values, see *Examples of Use of Design Ranges*.

Cathode-to-Grid-No.1

Voltage (E_{kg1}) for

Visual Extinction of

Focused Raster See Cutoff Design Chart for Cathode-Drive Service

Cathode-to-Grid-No.1

Video Drive from

Raster Cutoff

(Black Level):

White-level value

(Peak negative). Same value as determined for E_{kg1}

Grid-No.4 Current. -25 to +25 μ amp

Grid-No.2 Current. -15 to +15 μ amp

Ion-Trap Magnet Current

(Average)** $\sqrt{E_{c5g1}/8000} \times 32$ ma

Minimum Field Strength of

PM Ion-Trap Magnet§. $\sqrt{E_{c5g1}/8000} \times 36$ gauss

Field Strength of Adjust-

able Centering Magnet. 0 to 5 gauss

Examples of Use of Design Ranges:

With ultor-to-grid-No.1

voltage of 6000 8000 volts

and grid-No.2-to-grid-No.1

voltage of 150 200 volts

Grid-No.4-to-Grid-No.1

Voltage for Focus

with Ultor Current

of 100 μ amp. +15 to +315 +60 to +360 volts

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 4000 volts.

§: See next page.



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Cathode-to-Grid-No.1 Voltage for Visual Extinction of Fo- cused Raster.	14 to 30	17 to 39	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	14 to 30	17 to 39	volts
Minimum Field Strength of PM Ion-Trap Magnet . . .	31	36	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437 or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussess. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

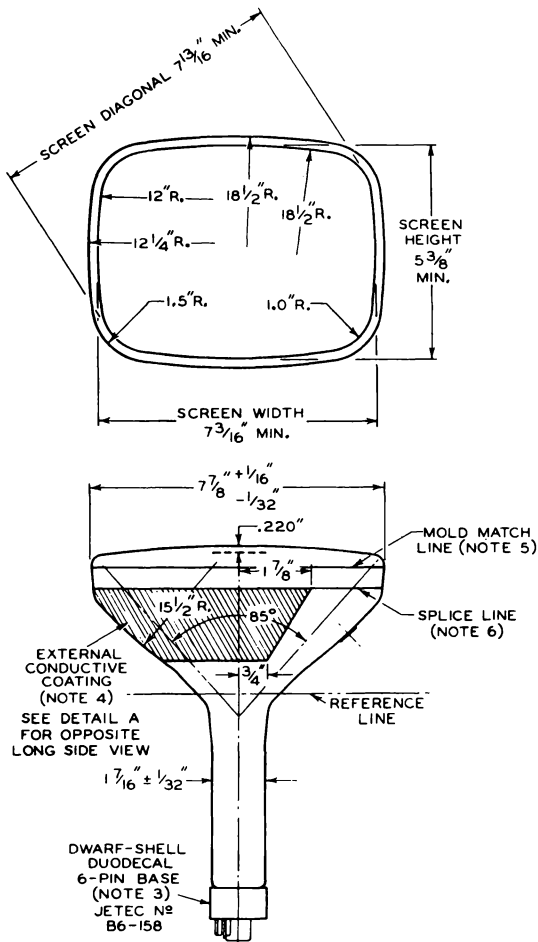
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

8DP4



8DP4

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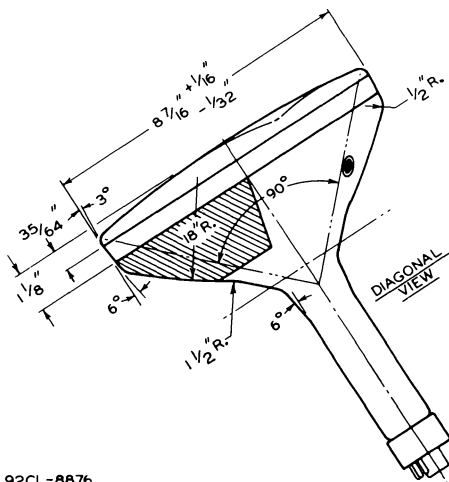
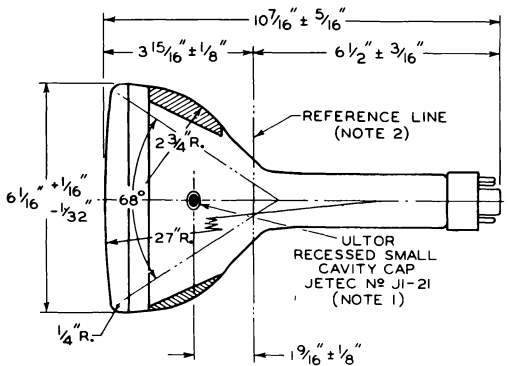




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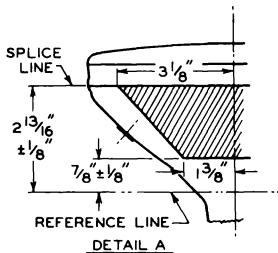
8DP4



92CL-8876



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NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTORTERMIAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AT THE REFERENCE LINE AND HAVING A DIAMETER OF $1-5/8$ INCHES.

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: THE MAXIMUM RADIAL DISPLACEMENT OF THE FACE PANEL JUST ABOVE THE MOLD MATCH IS 0.040 " WHEN THE TUBE IS ROTATED ABOUT THE AXIS OF THE NECK AND SUPPORTED AT THE REFERENCE LINE.

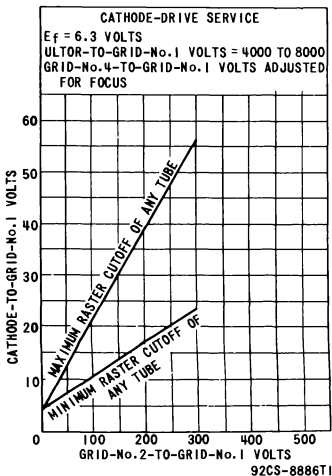
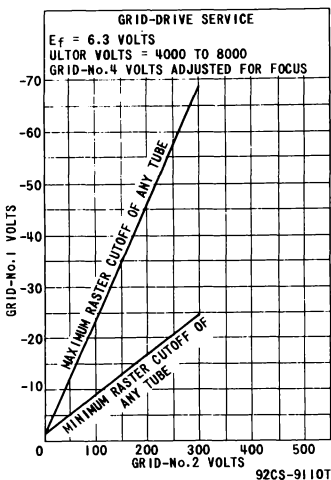
NOTE 6: BULGE AT SPLICE-LINE SEAL WILL NOT PROTRUDE BEYOND THE MAXIMUM ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



8DP4

CUTOFF DESIGN CHARTS

8DP4



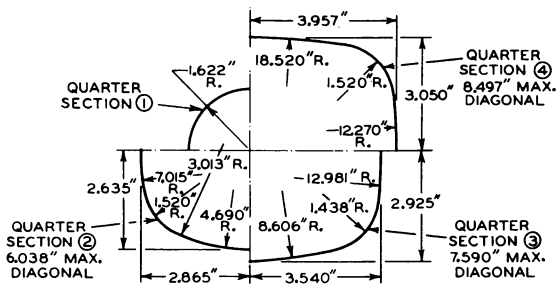
8DP4



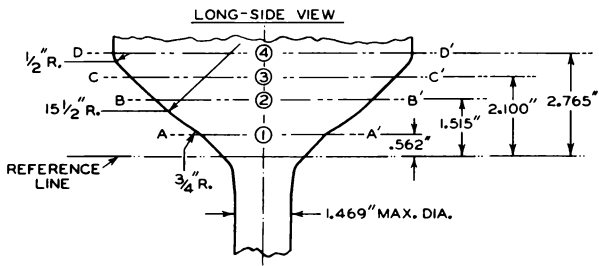
8DP4

KINESCOPE

BULB-CONTOUR DIMENSIONS



TOP VIEW SHOWING MAXIMUM QUARTER-SECTION CONTOURS
DEFINED BY PLANES AA', BB', CC', and DD'.



CONTOURS (1), (2), (3), AND (4) DEFINE MAXIMUM BULB DIMENSIONS IN THE PLANES AA', BB', CC', AND DD'. THE PLANES ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS

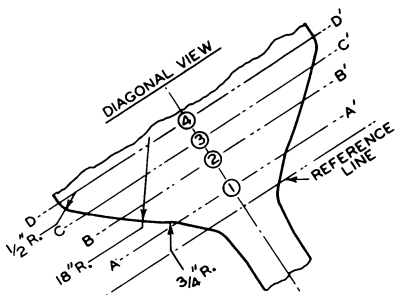
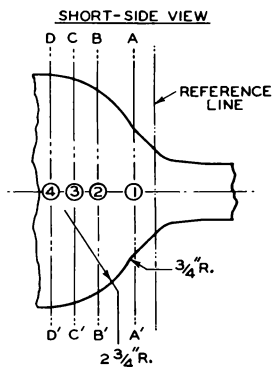


8DP4

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8DP4

FOR MAXIMUM SPACE REQUIREMENTS

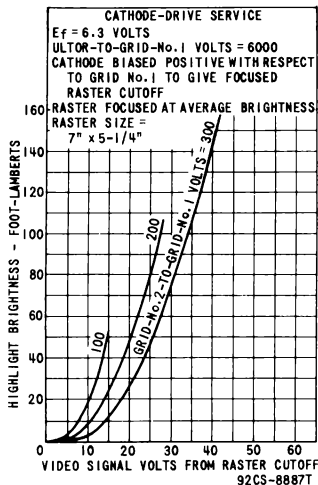
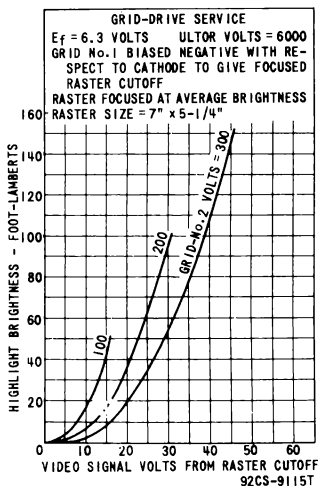


92CM-8896

FROM THE REFERENCE LINE. WHEN DIMENSIONED FROM THE FACEPLATE, THE AXIAL POSITIONS OF PLANES AA', BB', CC', AND DD' WILL VARY BY ± 0.125 ".



AVERAGE DRIVE CHARACTERISTICS

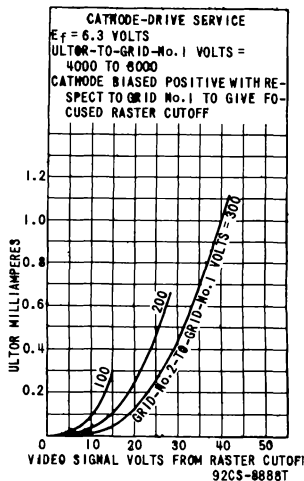
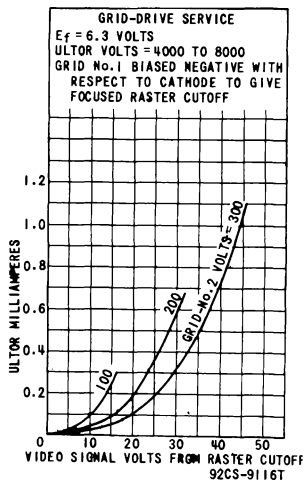




8DP4

8DP4

AVERAGE DRIVE CHARACTERISTICS





9AP4/1804-P4

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Heater	Coated Unipotential Cathode	
Voltage	2.5	a-c or d-c volts
Current	2.1	amp.
Focus		Electrostatic
Deflection		Magnetic
Phosphor		No. 4
Fluorescence		White
Persistence		Medium
Direct Interelectrode Capacitance:		
Grid No.1 to All Other Electrodes		9 μ f
Overall Length		21" $\pm$ 3/8"
Diameter		9" $\pm$ 1/8"
Bulb		J-72
Cap		Medium Metal
Base		Medium 6-Pin

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts

High-Voltage Electrode (Anode No.2) Volt.	7000 max.	volts
Focusing Electrode (Anode No.1) Volt.	2000 max.	volts
Accelerating Electrode (Grid No.2) Volt.	250 max.	volts
Control Electrode (Grid No.1) Volt.	Never positive	
Fluorescent Screen Input Power/sq cm :		
Fixed Pattern	2.5 max.	mw
Moving Pattern	5.0 max.	mw
Grid Circuit Resistance	1.5 max.	megohms

Typical Operation:

Cathode	{should be connected to one side or to mid-tap of heater winding	
Anode No.2 Voltage	6000	7000 volts
Anode No.1 Voltage $\square$	1225	1425 <u>approx. volts</u>
Grid No.2 Voltage	250	250 <u>volts</u>
Grid No.1 Voltage $\circ$	Adjusted to give suitable luminous spot	
Grid No.1 Signal-Swing Volt. $\blacktriangle$	25	25 <u>approx. volts</u>

NOTE: Brilliance and definition decrease with decreasing anode voltages. In general the anode No.2 voltage should not be less than 5000 volts.

- $\square$ Supply should be adjustable to $\pm 20\%$ of the value shown.
- $\circ$ Approximately 35% of Grid No.2 voltage is required for current cut-off when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.
- $\blacktriangle$ Peak-to-peak value for good brilliance with good resolution. For greater brilliance, up to twice this value should be available.

The Characteristic Curves for the 9AP4 are the same as those for the 12AP4.

$\leftarrow$ Indicates a change.

Jan. 30, 1942

RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

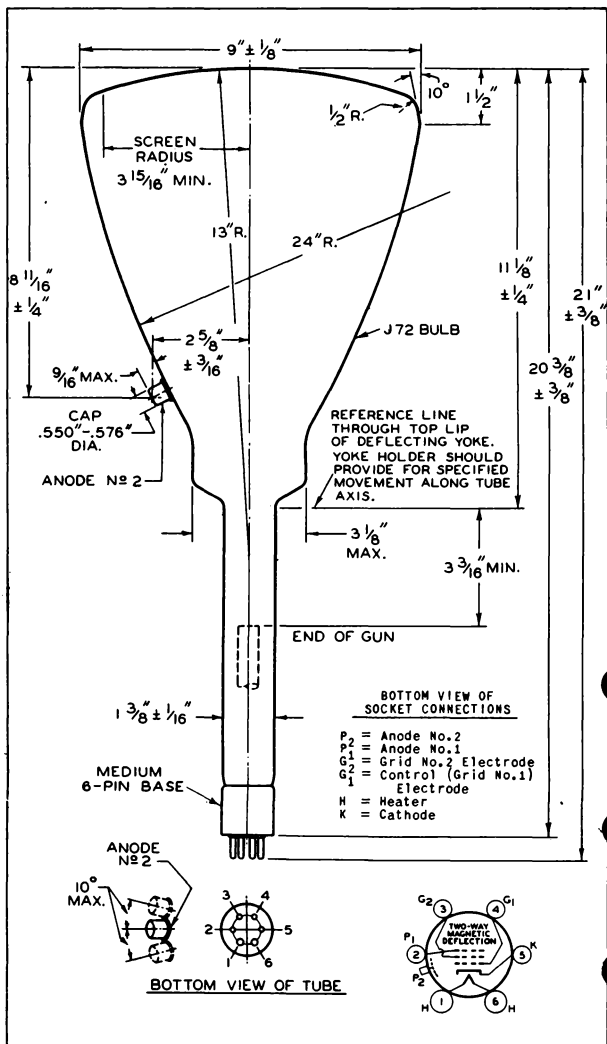
DATA

9AP4



9AP4/1804-P4

KINESCOPE



Jan. 30, 1942

RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6015R1



Delete

IOBP4

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MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. . . . 6.5 μf

Cathode to All Other Electrodes. 5.0 μf

External Conductive Coating to Anode No.2 { 2500 max. μf
500 min. μf

Phosphor (For Curves, see front of this Section) No.4

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 50°

Ion Trap Magnetic

External Coating Conductive

Overall Length 17-5/8" $\pm$ 3/8"

Greatest Diameter of Bulb. 10-1/2" $\pm$ 1/8"

Minimum Useful Screen Diameter 9"

Raster Size (Approx.) 6" x 8"

Mounting Position. Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 7-Pin

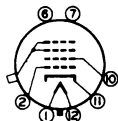
BOTTOM VIEW

Pin 1- Heater

Pin 2- Grid No.1

Pin 6- No Connection

Pin 7- No Connection



Pin 10- Grid No.2

Pin 11- Cathode

Pin 12- Heater

Cap - Anode,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE ■ 10000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts ←

Positive peak value. 2 max. volts ←

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts ←

After equipment warm-up period 125 max. volts

Heater positive with respect to cathode. . . . 125 max. volts

■ See next page.

← Indicates a change.

10BP4



10BP4 KINESCOPE

→ Typical Operation:

Anode Voltage*	9000	volts
Grid-No.2 Voltage.	250	volts
Grid-No.1 Voltage ^o	-27 to -63	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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→ Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-Circuit Resistance	11000 min.	ohms

The resistors used should be capable of withstanding the voltages involved.

Components:

Ion-Trap Magnet*	RCA Type No.203D1
Deflection Yoke*	RCA Type No.201D1
Focusing Coil**	RCA Type No.202D1

■ The anode and grid No.3 which are connected together within tube are referred to herein as anode.

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 8000 volts.

o Visual extinction of undeflected focused spot.

* The dc current required by this magnet is approx. 109 ma. for the typical operating conditions shown.

* The horizontal deflecting-coil current required by this yoke to produce 8" picture width is approx. 470 ma. peak-to-peak under the typical operating conditions shown. The current varies directly as the square root of the anode voltage.

** The dc current required by this coil is approx. 115 ma. for the typical operating conditions shown and using combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 6" x 8" picture area. Distance from reference line (see Outline Drawing) to center line of air gap is approx. 3-1/4".

→ Indicates a change.

MAR. 15, 1948

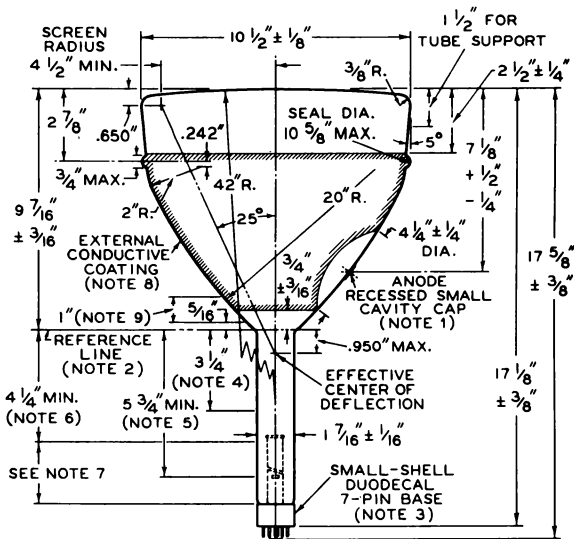
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

10BP4
KINESCOPE

10BP4

S. S. S.



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

NOTE 4: APPROX. DISTANCE TO CENTER OF FOCUSING-COIL AIR GAP.

NOTE 5: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH PIN No.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN No.6 AND SOUTH POLE TO PIN No.12.

10BP4



10BP4
KINESCOPE

(continued from preceding page)

NOTE 6: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL AIR GAP MUST BE WITHIN THIS SPACE.

NOTE 7: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 8: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 9: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED AREA AROUND ANODE CAP.

92CM-6663R2



10BP4-A KINESCOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

10BP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf

Cathode to All Other Electrodes. 5 μf

External Conductive Coating to Anode $\left\{ \begin{array}{l} 2000 \text{ max. } \mu\text{f} \\ 500 \text{ min. } \mu\text{f} \end{array} \right.$

Face Plate (Transmission of about 65%) RCA "Filterglass"

Phosphor (For Curves, see front of this Section) No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 52°

Ion-Trap Gun Requires External Double-Field Magnet

Overall Length $17-5/8" \pm 3/8"$

Greatest Diameter of Bulb. $10-1/2" \pm 1/8"$

Screen Diameter. $9-3/8"$

Mounting Position. Any

Cap. Recessed Small Cavity

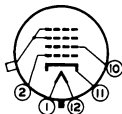
Base Small-Shell Duodecal 5-Pin

Basing Designation for BOTTOM VIEW 12D1

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2



Pin 11-Cathode

Pin 12-Heater

Cap - Anode,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE^oVOLTAGE^o 12000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not
exceeding 15 seconds 410 max. volts

After equipment warm-up period 150 max. volts

Heater positive with respect to cathode. 150 max. volts

^o Anode and grid No.3, which are connected together within tube, are referred to herein as anode.

^o The product of anode voltage and average anode current should be limited to 6 watts.

10BP4-A



10BP4-A KINESCOPE

Typical Operation:

Anode Voltage*	9000	11000	volts
Grid-No.2 Voltage.	250	250	volts
Grid-No.1 Voltage for Visual Extinction of Undelected			
Focused Spot	-27 to -63	-27 to -63	volts
Focusing-Coil Current (DC, Approx.)†	115	125	ma
Ion-Trap-Magnet Current (DC, Approx.)#	155	180	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max. megohms
------------------------------	------------------

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 ma. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	150 min. ohms
Grid-No.2-Circuit Resistance	470 min. ohms
Anode-Circuit Resistance	15000 min. ohms

The resistors used should be capable of withstanding the applied voltage.

Components:

Horizontal-Deflection-Output & High-Voltage Transformer:

For use with pulse-operated high-voltage supply giving 10000-12000 volts	RCA-217T1
Horizontal Linearity Control	RCA-207R1
Width Control	RCA-206R1
Vertical-Deflection Output Transformer	RCA-204T9
Deflecting Yoke	RCA-205D1
Ion-Trap Magnet (Permanent-Magnet Type)	RCA-203D3
Focusing Coil ⁰⁰	RCA-202D1

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 8000 volts.

† For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4 inches from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 25 foot-lamberts for 9000volts, or 30 foot-lamberts for 11000 volts, on an 8" x 6" picture area.

For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give maximum brightness.

⁰⁰ Renewal Sales item only.



Technical drawing of a small-shell duodecal 5-pin base, showing top and side views with dimensions and labels.

Top View Dimensions:

- Overall width: $10\frac{1}{2} \pm \frac{1}{8}$ "
- Screen diameter: $9\frac{3}{8}$ "
- Minimum screen diameter: $9\frac{1}{8}$ "
- Distance from top edge to seal: $2\frac{7}{8}$ "
- Seal diameter: $10\frac{5}{8}$ " MAX.
- Distance from seal to anode: $7\frac{1}{8}$ "
- Distance from anode to base: $17\frac{5}{8} \pm \frac{3}{8}$ "
- Distance from base to reference line: $4\frac{1}{4}$ " MIN. (NOTE 5)
- Distance from reference line to base: $5\frac{3}{4}$ " MIN. (NOTE 4)
- Distance from base to bottom edge: $1\frac{7}{16} \pm \frac{1}{16}$ "

Side View Dimensions:

- Overall height: $17\frac{5}{8} \pm \frac{3}{8}$ "
- Distance from top edge to seal: $2\frac{7}{8}$ "
- Seal diameter: $10\frac{5}{8}$ " MAX.
- Distance from seal to anode: $7\frac{1}{8}$ "
- Distance from anode to base: $17\frac{5}{8} \pm \frac{3}{8}$ "
- Distance from base to reference line: $4\frac{1}{4}$ " MIN. (NOTE 5)
- Distance from reference line to base: $5\frac{3}{4}$ " MIN. (NOTE 4)
- Distance from base to bottom edge: $1\frac{7}{16} \pm \frac{1}{16}$ "

Labels and Notes:

- SCREEN DIA. $9\frac{3}{8}$ "
- MIN. VALUE $9\frac{1}{8}$ "
- 1 $\frac{1}{2}$ " FOR TUBE SUPPORT
- 2 $\frac{1}{2} \pm \frac{1}{4}$ "
- 7 $\frac{1}{8}$ "
- 7 $\frac{1}{16} + \frac{3}{16} - \frac{1}{16}$ R.
- 7" MIN. R.
- .242"
- .650"
- 3 $\frac{3}{4}$ " MAX.
- 2" R.
- 42" R.
- 20" R.
- 26°
- 3 $\frac{3}{4}$ "
- 3 $\frac{1}{16}$ "
- 4 $\frac{1}{4} \pm \frac{1}{4}$ " DIA.
- ANODE RECESSED SMALL CAVITY CAP (NOTE 1)
- .950" MAX.
- 1" (NOTE 8)
- 5 $\frac{1}{16}$ "
- REFERENCE LINE (NOTE 2)
- 4 $\frac{1}{4}$ " MIN. (NOTE 5)
- 5 $\frac{3}{4}$ " MIN. (NOTE 4)
- SEE NOTE 6
- SMALL-SHELL DUODECAL 5-PIN BASE (NOTE 3)
- EXTERNAL CONDUCTIVE COATING (NOTE 7)

10BP4-A



10BP4-A
KINESCOPE

NOTE 6: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 8: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED
CLEAR AREA AROUND ANODE CAP.



10BP4-A

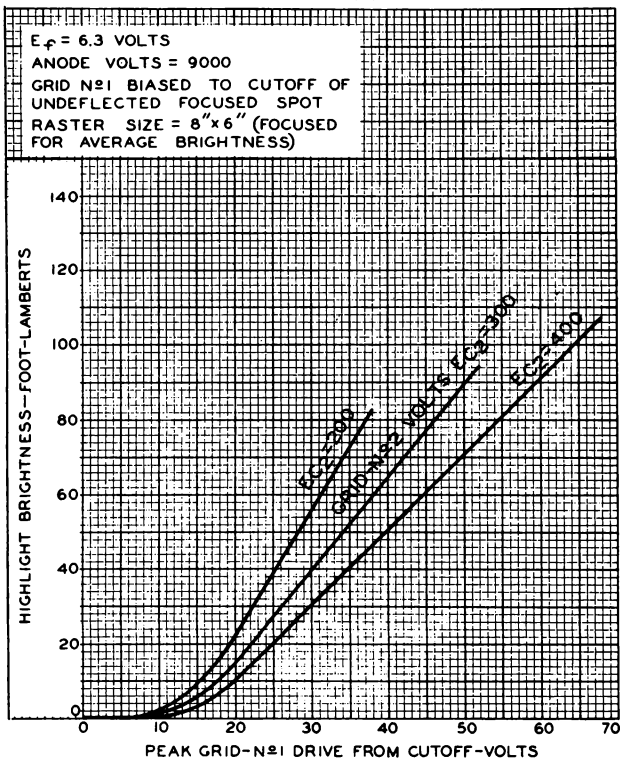
KINESCOPE

10BP4-A

CURVES

The following Grid-Drive Characteristics Curves are for the condition with grid No.1 biased to give visual extinction of the undeflected, focused spot. In viewing television pictures, it will be found that the actual cutoff voltage corresponding to black in the picture is approximately 5 volts less negative than shown on the curves; similarly, the grid-No.1 drive to obtain a given anode current or light output is also about 5 volts less.

AVERAGE GRID-DRIVE CHARACTERISTICS



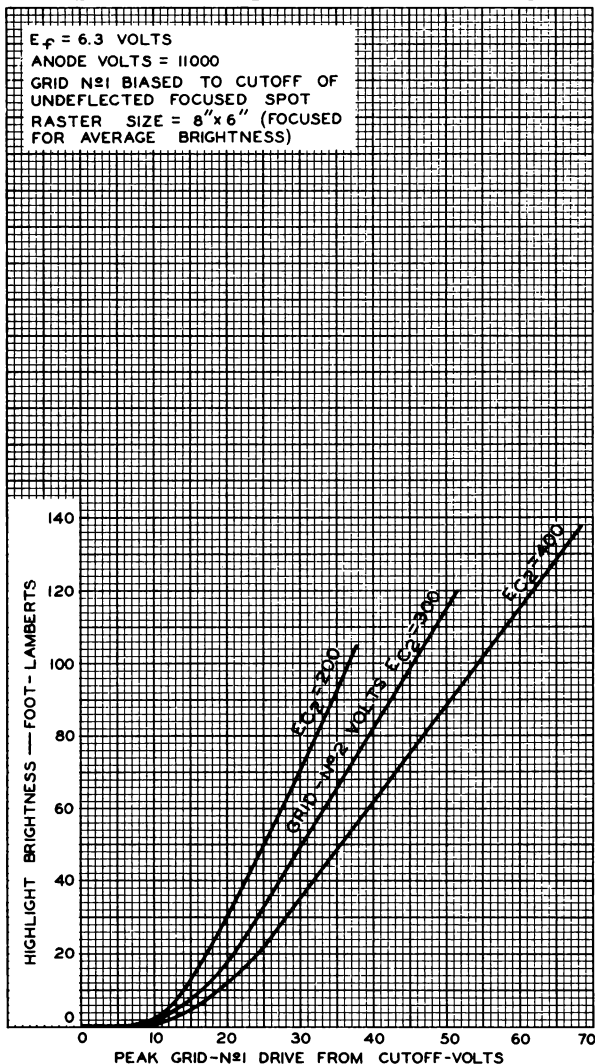
92CM-7448

10BP4-A



10BP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 15, 1950

TUBE DEPARTMENT

92CM - 7447

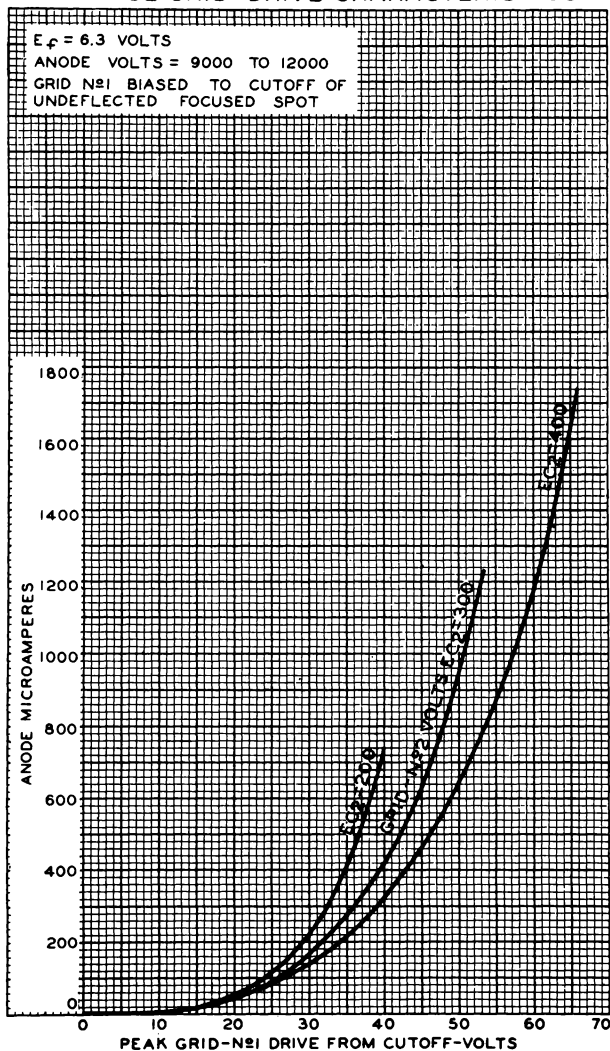
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



10BP4-A

10BP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 21, 1950

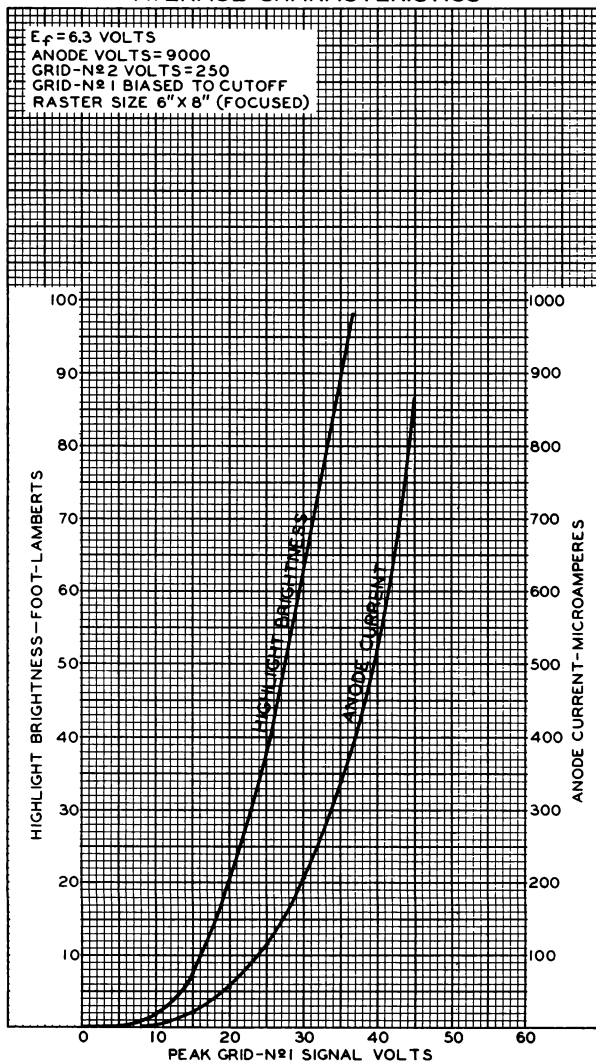
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7454



10BP4

AVERAGE CHARACTERISTICS



OCT. 9, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6675R2



10KP7 OSCILLOGRAPH TUBE

10KP7

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 $\pm$ 10% amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes 6 μ f $\leftarrow$

Cathode to all other electrodes 5 μ f $\leftarrow$

Faceplate Filterglass $\leftarrow$

Light transmission (Approx.). 77% $\leftarrow$

Phosphor (For curves, see front of this section). P7

Fluorescence. Blue

Phosphorescence Greenish-Yellow

Persistence Long

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.). 50°

Overall Length 17-5/8" $\pm$ 3/8"

Greatest Diameter of Bulb 10-1/2" $\pm$ 1/16" $\leftarrow$

Minimum Useful Screen Diameter. 9"

Weight (Approx.). 10 lbs $\leftarrow$

Mounting Position Any $\leftarrow$

Cap Recessed Small Cavity (JETEC No.J1-21) $\leftarrow$

Bulb. J-84 $\leftarrow$

Base. Small-Shell Duodecal 5-Pin (JETEC No.B5-57) $\leftarrow$

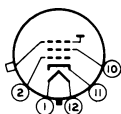
Basing Designation for BOTTOM VIEW. 12D $\leftarrow$

Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode



Pin 12 - Heater

Cap - Ultor
(Grid No.3,
Collector)

Maximum Ratings, Design-Center Values:

ULTOR[▲] VOLTAGE. 10000 max. volts

GRID-No.2 VOLTAGE:

Positive value (DC or Peak AC). 700 max. volts

Negative value (DC or Peak AC). 180 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 180 max. volts

Positive bias value[▲]. 0 max. volts

Positive peak value 2 max. volts

- The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 10KP7, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 10KP7, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

[▲]: See next page.

$\leftarrow$ Indicates a change.

NOV. 1, 1955

TUBE DIVISION

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

10KP7



10KP7

OSCILLOGRAPH TUBE

PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts
 PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. 125 max. volts
 Heater positive with respect to cathode. 125 max. volts

→ Equipment Design Ranges:

For any ultor voltage (E_{c2}) between 7000 and 10000 volts
 and grid-No.2 voltage (E_{c2}) between 150 and 700 volts*

Grid-No.1 Voltage for Visual
 Extinction of Undelected

Focused Spot -10.8% to -25.2% of E_{c2} volts

Grid-No.2 Current. -15 to +15 μ amp

Focusing-Coil Current (DC)⁰⁰ $\left[\sqrt{\frac{E_{c2}}{7000}} \times 99 \right] \pm 15\%$ ma

Spot Position. ##

Examples of Use of Design Ranges:

<i>For ultor voltage of</i>	7000	9000	volts
<i>and grid-No.2 voltage of</i>	250	250	volts

Grid-No.1 Voltage for Visual
 Extinction of Undelected

Focused Spot -27 to -63 -27 to -63 volts

→ Focusing-Coil Current (DC) . 99 $\pm 15\%$ 112 $\pm 15\%$ ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

▲ At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 7000 volts.

⁰⁰ For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 3-1/4" from Reference Line (See *Dimensional Outline*) and ultor current of 200. microamperes.

The center of the undeflected, unfocused spot will fall within a circle having an 18-mm radius concentric with the center of the tube face.

→ Indicates a change.

NOV. 1, 1955

DATA

TUBE DIVISION

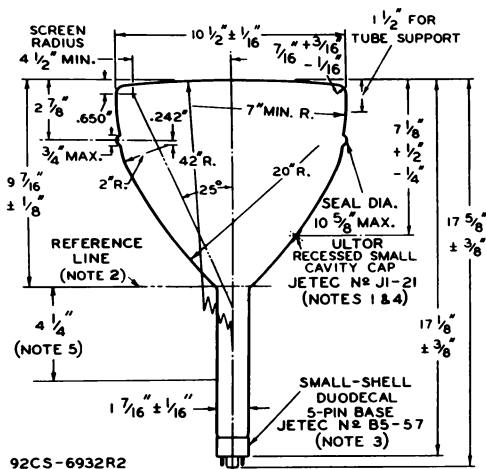
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



10KP7

10KP7

OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTROR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTROR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) $1.500" + .003" - .000"$ I.D. AND $2"$ LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF $1-7/8"$.

NOTE 4: FOR TUBE SUPPORT WHICH MUST BE KEPT AT LEAST $2"$ AWAY FROM ULTROR CAP.

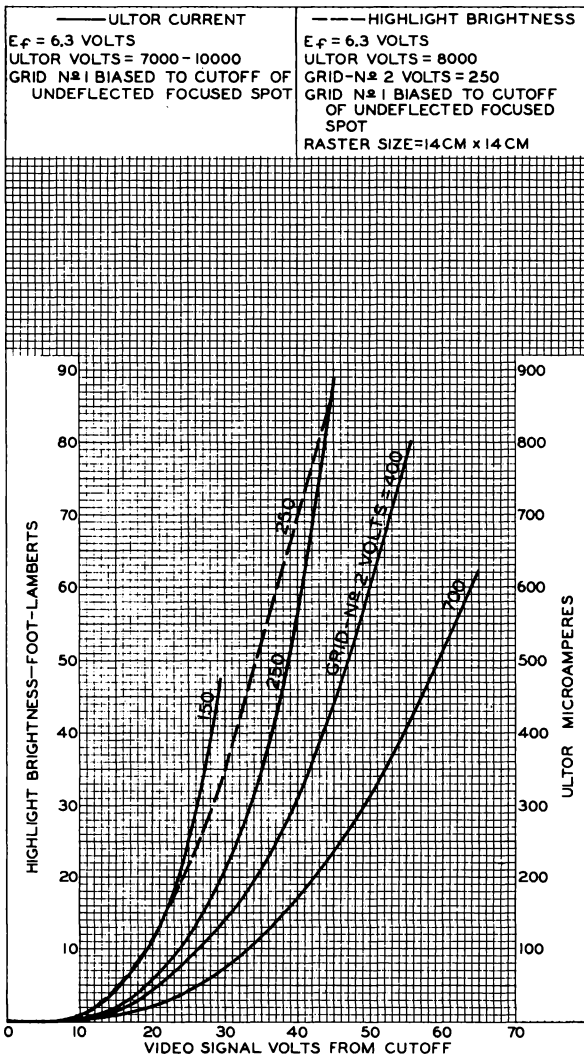
NOTE 5: LOCATION OF DEFLECTING YOKE AND FOCUSING COIL OR MAGNET MUST BE WITHIN THIS SPACE.

10KP7



10KP7

AVERAGE GRID-DRIVE CHARACTERISTICS





10SP4

10SP4

MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 6 μ f

Cathode to All Other Electrodes 5 μ f

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 66%

Phosphor^o, Metal-Backed P4—Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 50°

Overall Length 16-5/8" $\pm$ 3/8"

Greatest Diameter of Bulb 10-1/2" $\pm$ 1/8"

Minimum Useful Screen Diameter 9-1/8"

Picture Size (Within minimum-useful-screen area) 8" x 6"

Mounting Position Any

Cap Recessed Small Cavity (JETEC No. J1-21)

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

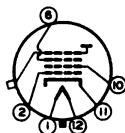
Pin 1—Heater

Pin 2—Grid No.1

Pin 6—Grid No.3

Pin 10—Grid No.2

Pin 11—Cathode



Pin 12—Heater

Cap—Ultor
(Grid No.4 &
Collector)

Maximum Ratings, Design-Center Values:

ULTOR[®] VOLTAGE 14000 max. volts

GRID—No.3 VOLTAGE 2700 max. volts

GRID—No.2 VOLTAGE 410 max. volts

GRID—No.1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

^o For curves, see front of this Section.

In the 10SP4, grid No.4 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

JULY 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MONITOR KINESCOPE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds . 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode . 180 max. volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 10000* and 14000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 410 volts

Grid-No.3 Voltage for Focus with

Ultor Current of 100 μ amp 11.7% to 15.9% of E_u volts

Grid-No.1 Voltage for

Visual Extinction of

8" x 6" Raster 9% to 24% of E_{c2} volts

Max. Grid-No.3 Current**

See Curves

Grid-No.2 Current

-15 to +15 μ amp

Field Strength of Adjustable

Centering Magnet 0 to 8 gauss

Examples of Use of Design Ranges:

For ultor voltage of	12000	14000	volts
and grid-No.2 voltage of	200	200	volts

Grid-No.3 Voltage for

Focus with Ultor

Current of 100 μ amp . 1400 to 1900 1640 to 2225 volts

Grid-No.1 Voltage for

Visual Extinction of

8" x 6" Raster -18 to -48 -18 to -48 volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.

** Grid-No.3 Current increases as the ultor voltage is decreased.

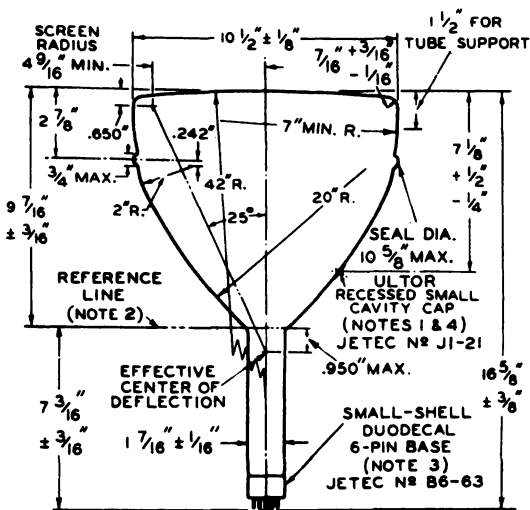
For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section



10SP4

10SP4

MONITOR KINESCOPE



92CM-7729

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. BULB TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) $1.500" + 0.003" - 0.000"$ I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF $1\frac{7}{8}"$.

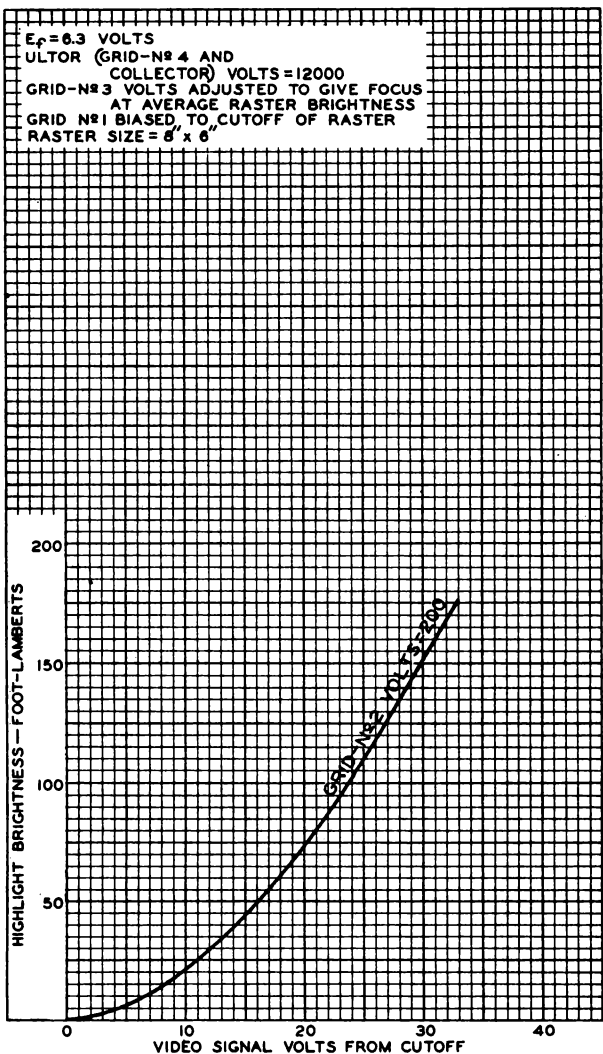
NOTE 4: TUBE SUPPORT MUST BE KEPT AT LEAST 2" AWAY FROM BULB TERMINAL.

10SP4



10SP4

AVERAGE GRID-DRIVE CHARACTERISTIC



MAR. 21, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

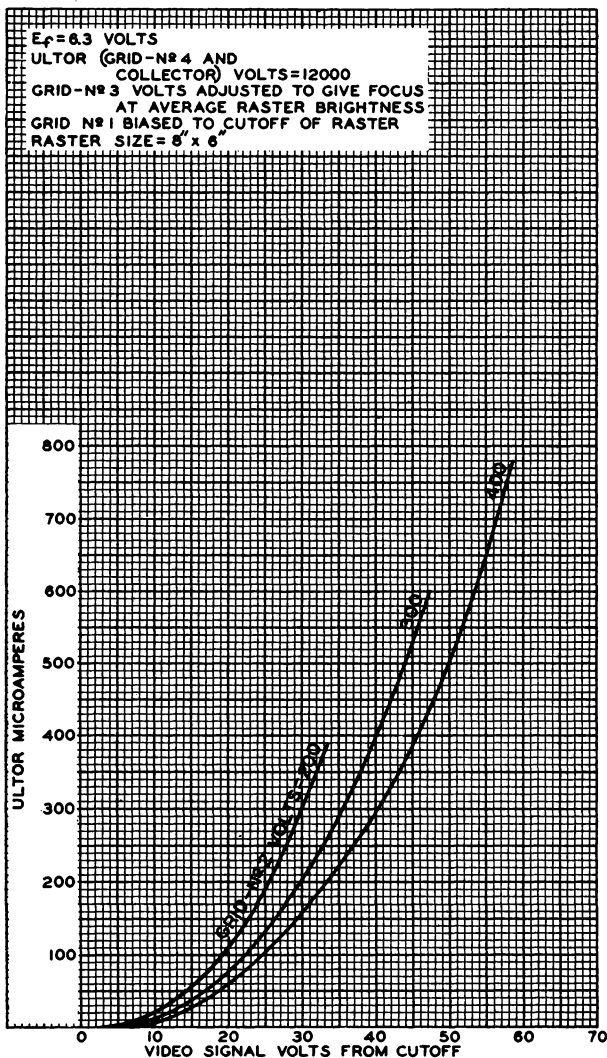
92CM-7774



10SP4

10SP4

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 21, 1952

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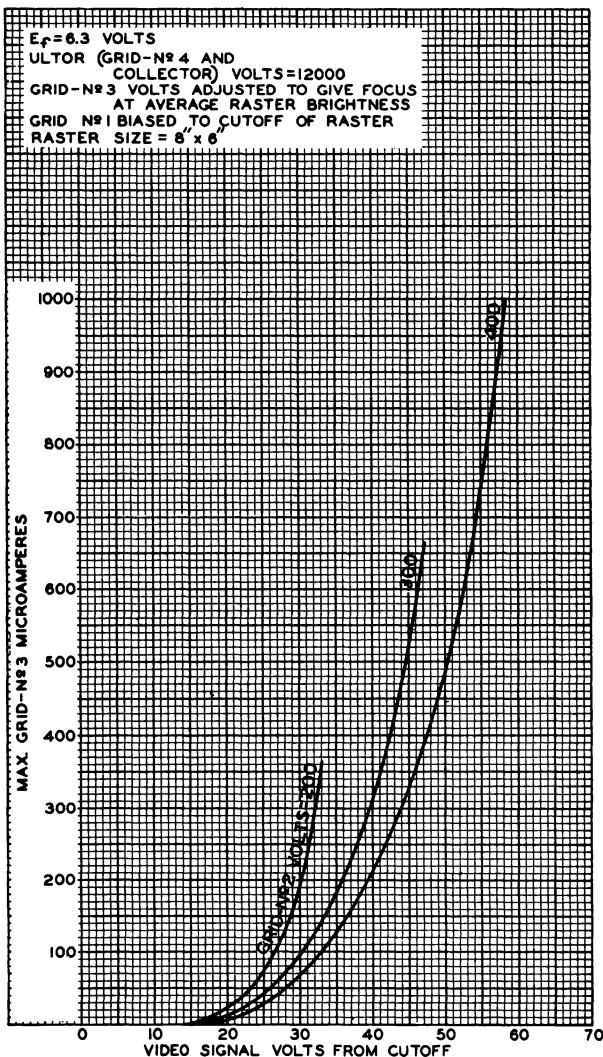
92CM-7773

10SP4



10SP4

GRID-DRIVE CHARACTERISTICS



MAR. 21, 1952

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7775



I2DP7-A OSCILLOGRAPH TUBE

I2DP7-A

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes 9 μf

Cathode to all other electrodes 6 μf

Faceplate, Spherical Filterglass ←

Light transmission (Approx.) 76%

Phosphor (For Curves, see front of this Section) P7

Fluorescence Blue

Persistence Short

Phosphorescence Greenish-Yellow

Persistence Long

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.) 50°

Overall Length $19\text{--}5/8" \pm 1/2"$

Greatest Diameter of Bulb $12" \pm 3/16"$

Minimum Useful Screen Diameter 10"

Weight (Approx.) 8 lbs

Mounting Position Any

Cap. Medium (JETEC No.C1-5)

Bulb J96

Base Long Medium-Shell Octal 8-Pin (JETEC No.88-65), ←

or Long Medium-Shell Octal 5-Pin (JETEC No.85-80)

Basing Designation for BOTTOM VIEW 5AN

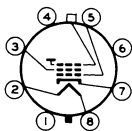
Pin 1 - No Connec-
tion

Pin 2 - Heater

Pin 3 - Grid No.2

Pin 4 - No Connec-
tion

Pin 5 - Grid No.1



Pin 6 - No Connec-
tion

Pin 7 - Cathode

Pin 8 - Heater

Cap - Ultor
(Grid No.3,
Collector)

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE 10000 max. volts

GRID-No.2 VOLTAGE:

Positive value (DC or Peak AC) 700 max. volts

Negative value (DC or Peak AC) 180 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 180 max. volts

Positive bias value[▲] 0 max. volts

Positive peak value 2 max. volts

[▲] At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.

← Indicates a change.

12DP7-A



12DP7-A

OSCILLOGRAPH TUBE

PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts
 PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode . . . 125 max. volts
 Heater positive with respect to cathode . . . 125 max. volts

Equipment Design Ranges:

For any ultor voltage (E_{c3}) between 4000 and 10000 volts
 and grid-No.2 voltage (E_{c2}) between 150 and 750 volts*

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot -10% to -28% of E_{c2} volts

Grid-No.2 Current. -15 to +15 μ amp

Focusing-Coil Current (DC)[∞] . $\left[\sqrt{\frac{E_{c3}}{4000}} \times 88.5 \right] \pm 15\%$ ma

Spot Position. ##

Examples of Use of Design Ranges:

<i>For ultor voltage of</i>	4000	7000	volts
<i>and grid-No.2 voltage of</i>	250	250	volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot -25 to -70 -25 to -70 volts

Focusing-Coil Current (DC) . . . 75 to 102 99 to 135 ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 4000 volts.

∞ For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 4-1/8" from Reference Line (See Dimensional Outline) and ultor current of 200 microamperes.

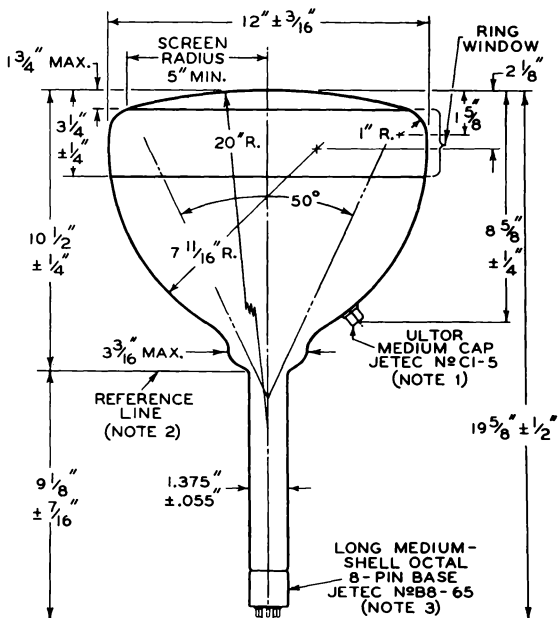
The center of the undeflected, unfocused spot will fall within a circle having a 20-mm radius concentric with the center of the tube face.



12DP7-A

OSCILLOGRAPH TUBE

12DP7-A



92CM-6375R6

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN No.5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE $1.430'' + .003'' - .000''$ I.D. and 2" LONG WILL REST ON BULB CONE.

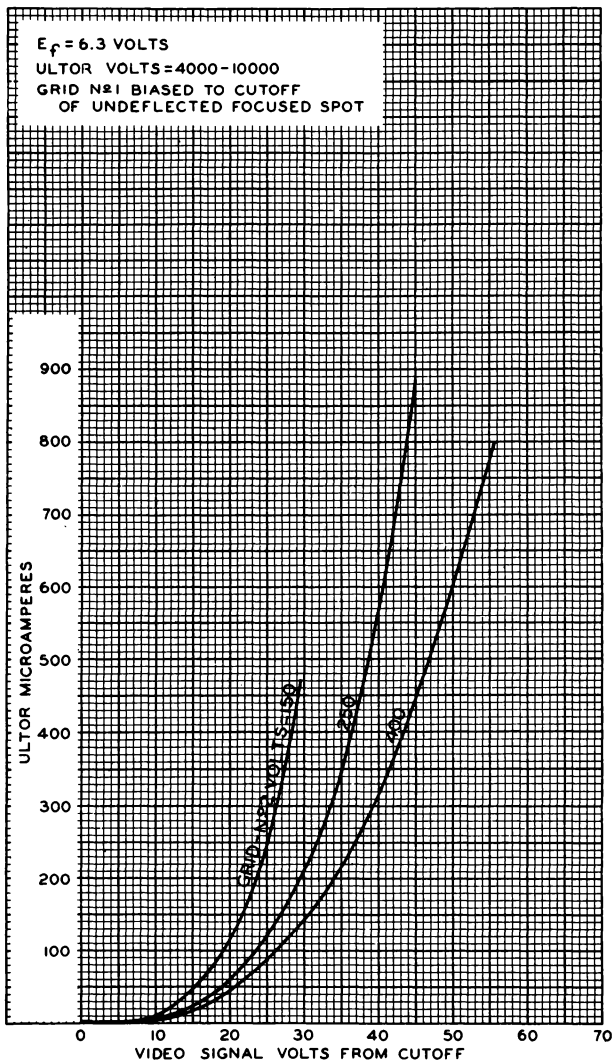
NOTE 3: $\angle$ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

12DP7-A



12DP7-A

AVERAGE GRID-DRIVE CHARACTERISTICS



APRIL 9, 1952

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6943RI



12DP7-B

12DP7-B OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

The 12DP7-B is the same as the 12DP7-A except for the following items:

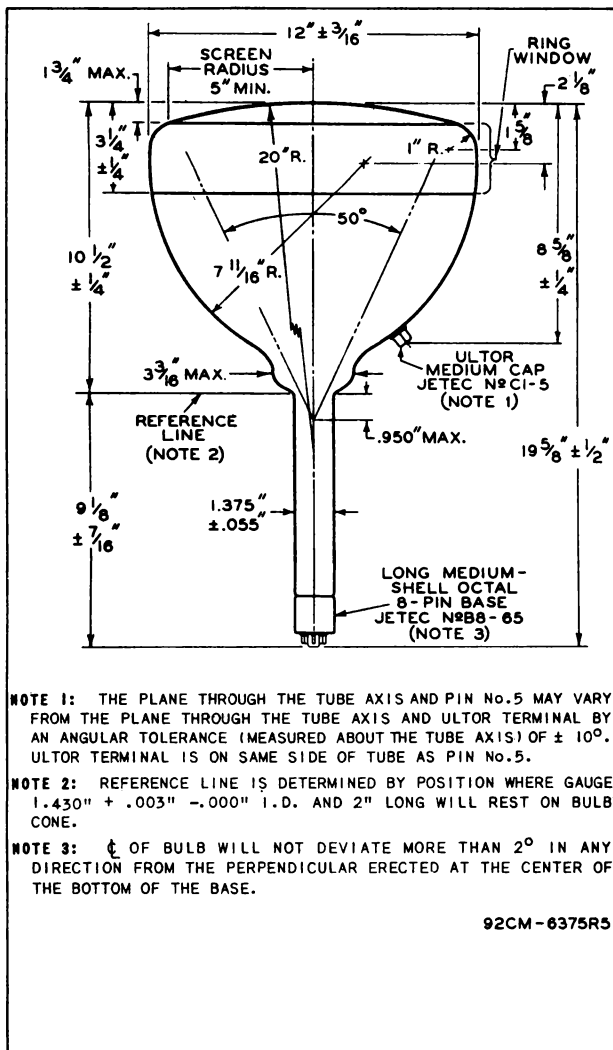
General:

Faceplate, Spherical	Filterglass
Light transmission (Approx.)	76%



12DP7-8

OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN NO.5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN NO.5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE
1.430" + .003" -.000" I.D. AND 2" LONG WILL REST ON BULB
CONE.

NOTE 3: $\angle$ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

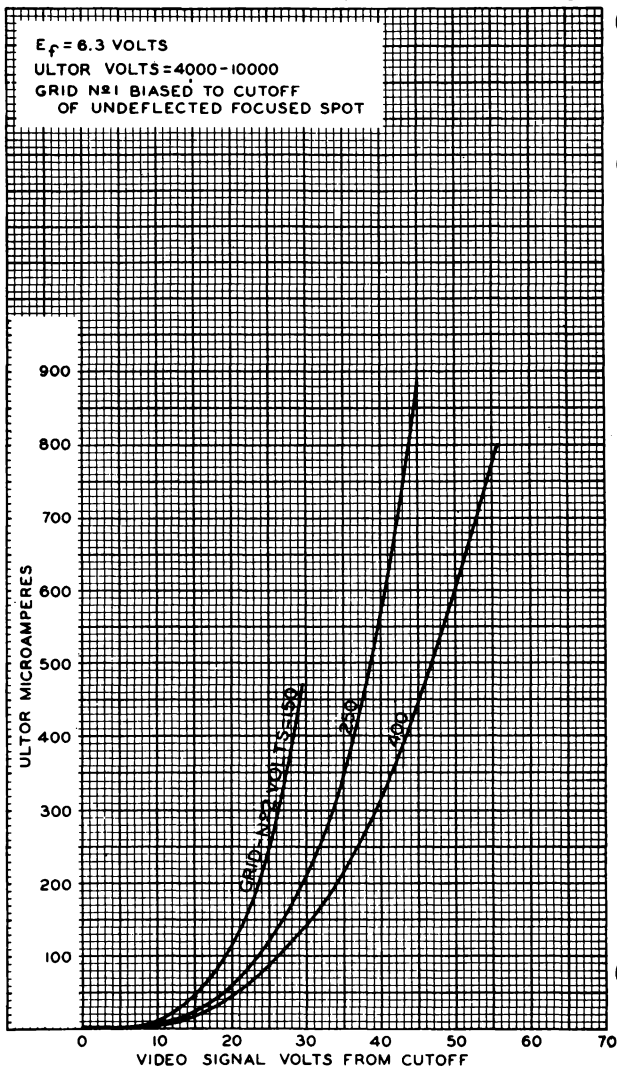
92CM-6375R5

12DP7-B



12DP7-B

AVERAGE GRID-DRIVE CHARACTERISTICS



APRIL 9, 1952

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6943RI



12LP4

KINESCOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

12LP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf Cathode to All Other Electrodes. 5 μf External Conductive Coating to Anode $\left\{ \begin{array}{l} 3000 \text{ max.} \\ 750 \text{ min.} \end{array} \right.$ μf

Phosphor (For Curves, see front of this Section) No.4

Fluorescence White

Phosphorescence. White

Persistence Medium

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 57°

Ion-Trap Gun Requires External Double-Field Magnet

Overall Length 18-3/4 $\pm$ 3/8"Greatest Diameter of Bulb. 12-7/16 $\pm$ 1/8"

Screen Diameter. 11-3/8"

Raster Size (Approx.) 7-1/2" $\times$ 10"

Mounting Position. Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 7-Pin

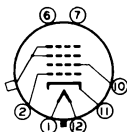
Basing Designation for BOTTOM VIEW 12D

Pin 1-Heater

Pin 2-Grid No.1

Pin 6-No Connection

Pin 7-No Connection



Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater

Cap -Anode,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE[■] 12000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 150 max. volts

Heater positive with respect to cathode. 150 max. volts

[■] Anode and grid No.3, which are connected together within tube, are referred to herein as anode.

12LP4



12LP4 KINESCOPE

Typical Operation:

Anode Voltage*	9000	11000	volts
Grid-No.2 Voltage.	250	250	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-27 to -63	-27 to -63	volts
Focusing-Coil Current (DC, Approx.)**.	115	125	ma
Ion-Trap Magnet Current (DC) #.	155	180	ma

Maximum Circuit Values:

Grid-No.1 -Circuit Resistance. 1.5 max. megohms

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1 -Circuit Resistance.	150 min.	ohms
Grid-No.2 -Circuit Resistance.	470 min.	ohms
Anode-Circuit Resistance	15000 min.	ohms

The resistors should be capable of withstanding the applied voltages.

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 9000 volts.

** For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4" from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 25 foot-lamberts for 9000 volts, or 30 foot-lamberts for 11000 volts, on a 7-1/2" x 10" picture area.

For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give good line focus with maximum brightness.

CURVES

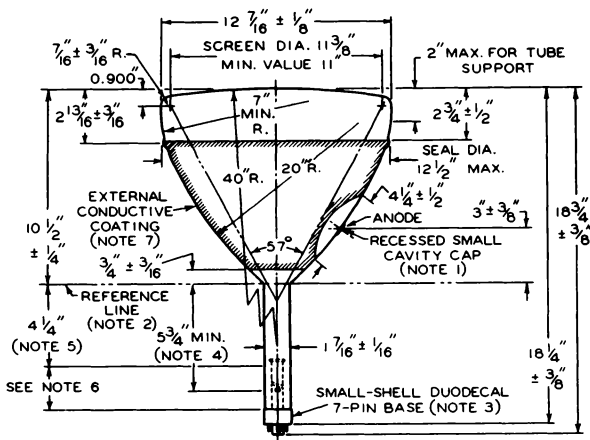
The following Grid-Drive Characteristics Curves are for the condition with grid No.1 biased to give visual extinction of the undeflected, focused spot. In viewing television pictures, it will be found that the actual cutoff voltage corresponding to black in the picture is approximately 5 volts less negative than shown on the curves; similarly, the grid-No.1 drive to obtain a given anode current or light output is also about 5 volts less negative.



12LP4 KINESCOPE

12LP4

delete



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE $1.500" + .003" - .000"$ I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF $1-\frac{7}{8}"$.

NOTE 4: DISTANCE OF INTERNAL POLE PIECES. PLANE THROUGH PIN No. 6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN No. 6 AND SOUTH POLE TO PIN No. 12.

NOTE 5: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL MUST BE WITHIN THIS SPACE.

NOTE 6: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

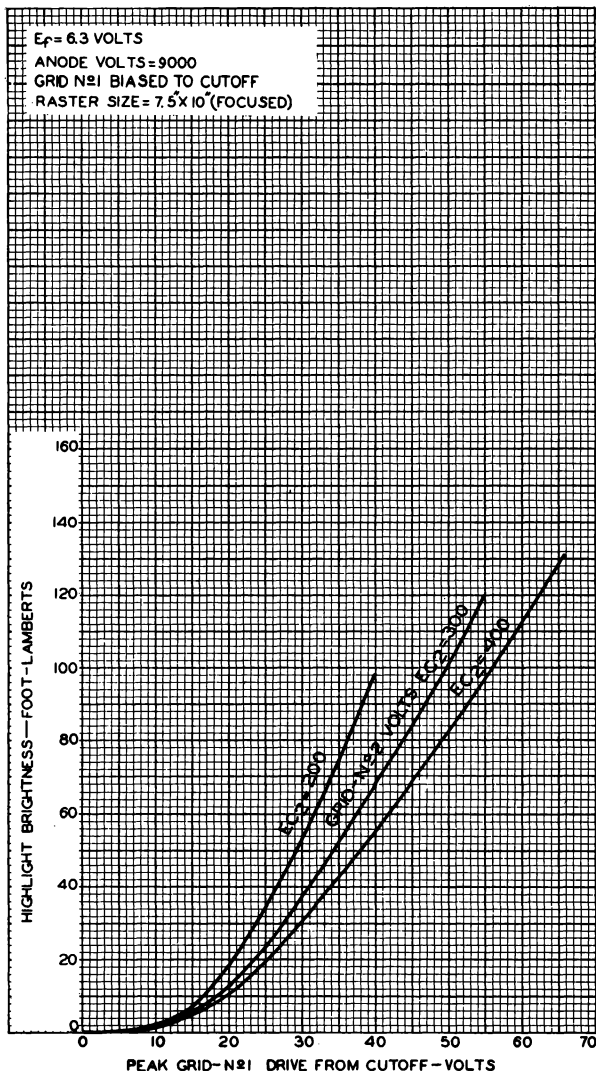
92CM-7276

12LP4



12LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



JUNE 28, 1949

TUBE DEPARTMENT

92CM-7309

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

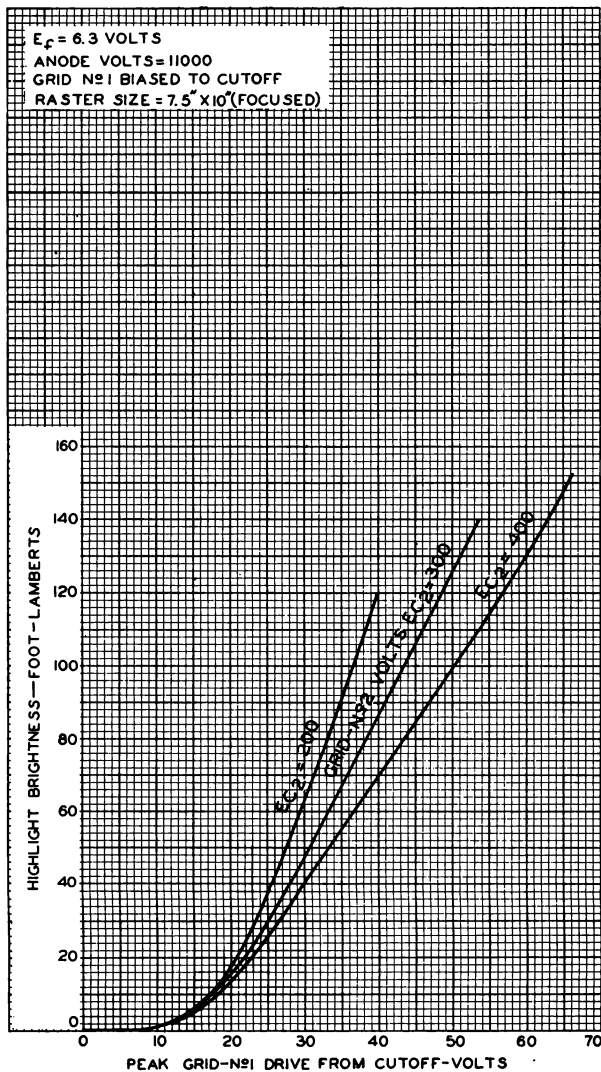


12LP4

Labate

12LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



JUNE 30, 1949

TUBE DEPARTMENT

92CM-7310

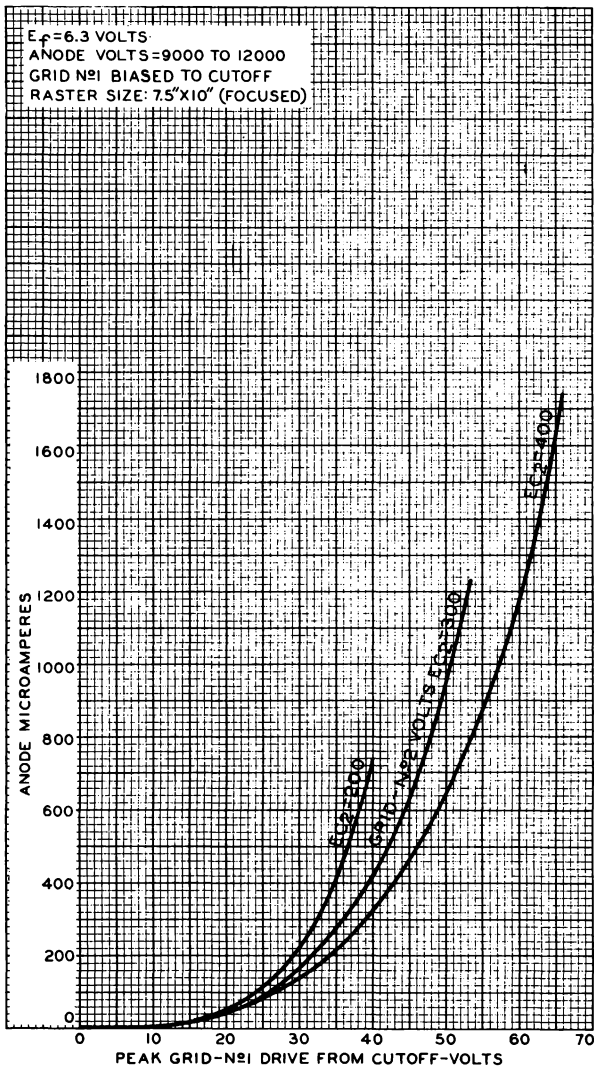
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12LP4



12LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



JUNE 23, 1949

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7306



12LP4-A

KINESCOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

12LP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 $\mu\mu\text{f}$

Cathode to All Other Electrodes. 5 $\mu\mu\text{f}$

External Conductive Coating to Anode $\left\{ \begin{array}{l} 2000 \text{ max.} \\ 750 \text{ min.} \end{array} \right. \mu\mu\text{f}$

Face Plate (Transmission of about 65%). RCA "Filterglass"

Phosphor (For Curves, see front of this Section) No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 57°

Ion-Trap Gun Requires External Double-Field Magnet

Overall Length $18-3/4 \pm 3/8"$

Greatest Diameter of Bulb. $12-7/16 \pm 1/8"$

Screen Diameter. $11-3/8"$

Mounting Position. Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 5-Pin

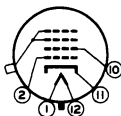
Basing Designation for BOTTOM VIEW $12D_1$

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2

Pin 11-Cathode



Pin 12-Heater

Cap -Anode,
Grid No.3

Maximum Ratings, Design-Center Values:

ANODE^aVOLTAGE* 12000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 150 max. volts

Heater positive with respect to cathode. 150 max. volts

^a Anode and grid No.3, which are connected together within tube, are referred to herein as anode.

* The product of anode voltage and average anode current should be limited to 6 watts.

12LP4-A



12LP4-A

KINESCOPE

Typical Operation:

Anode Voltage*	9000	11000	volts
Grid-No.2 Voltage.	250	250	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-27 to -63	-27 to -63	volts
Focusing-Coil Current (DC, Approx.)**	115	125	ma
Ion-Trap Magnet Current (DC)†	155	180	ma

Maximum Circuit Values:

Grid-No.1 - Circuit Resistance.	1.5 max. megohms
---------------------------------	------------------

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1 - Circuit Resistance.	150 min. ohms
Grid-No.2 - Circuit Resistance.	470 min. ohms
Anode - Circuit Resistance	15000 min. ohms

The resistors should be capable of withstanding the applied voltages.

Components:**Horizontal-Deflection-Output & High-Voltage Transformer:**

For use with pulse-operated high-voltage supply
giving 10000-12000 volts

Horizontal Linearity Control	RCA-217T1
Width Control	RCA-207R1
Vertical-Deflection Output Transformer	RCA-206R1
Deflecting Yoke.	RCA-204T9
Ion-Trap Magnet (Permanent-Magnet Type).	RCA-205D1
Focusing Coil ^{oo} .	RCA-203D3
	RCA-202D1

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 9000 volts.

** For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4" from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 17 foot-lamberts for 9000 volts, or 20 foot-lamberts for 11000 volts, on a 10" x 7-1/2" picture area.

† For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give maximum brightness.

^{oo} Renewal Sales item only.

MAY 1, 1950

TUBE DEPARTMENT

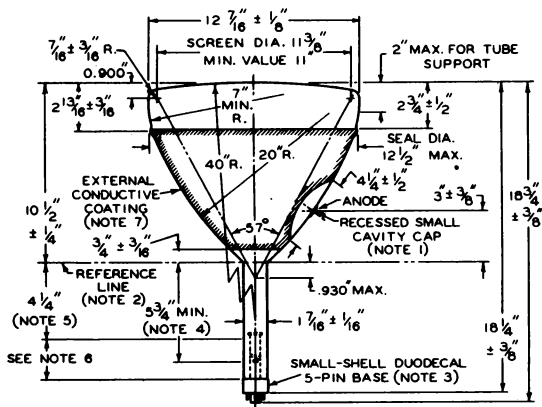
DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



12LP4-A KINESCOPE

12LP4-A



92CM-7276R2

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10° . ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE $1.500" + .003" - .000"$ I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF $1-7/8"$.

NOTE 4: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH VACANT PIN POSITION No.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.6 AND SOUTH POLE TO PIN No.12.

NOTE 5: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL MUST BE WITHIN THIS SPACE.

NOTE 6: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDING.

12LP4-A

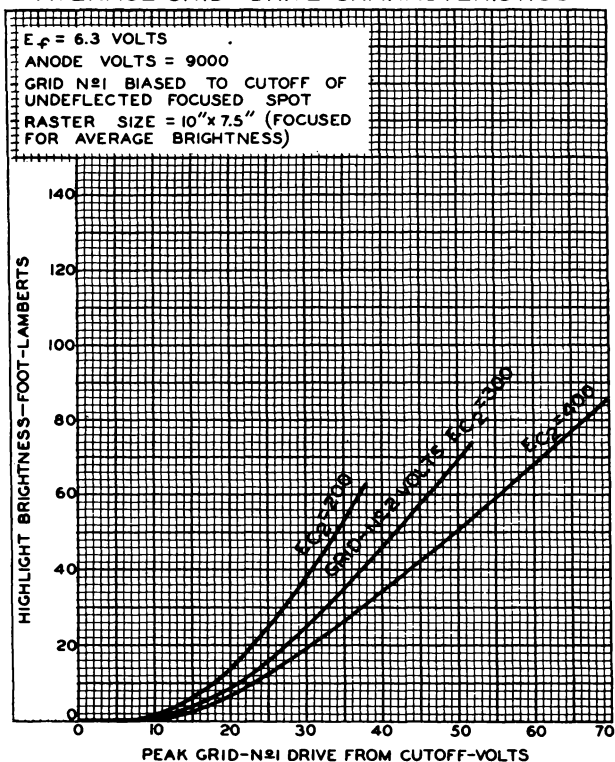


12LP4-A KINESCOPE

CURVES

The following Grid-Drive Characteristics Curves are for the condition with grid No.1 biased to give visual extinction of the undeflected, focused spot. In viewing television pictures, it will be found that the actual cutoff voltage corresponding to black in the picture is approximately 5 volts less negative than shown on the curves; similarly, the grid-No.1 drive to obtain a given anode current or light output is also about 5 volts less.

AVERAGE GRID-DRIVE CHARACTERISTICS



92CM-7452

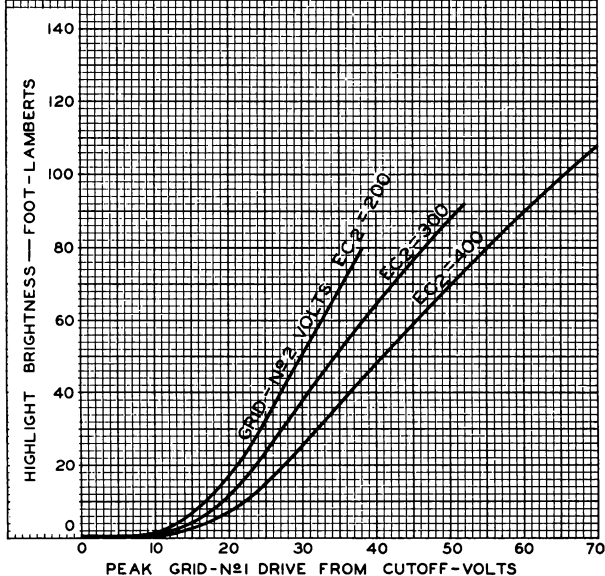


12LP4-A

12LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE VOLTS = 11000
GRID N₂ BIASED TO CUTOFF OF
UNDEFLECTED FOCUSED SPOT
RASTER SIZE = 10" x 7.5" (FOCUSED
FOR AVERAGE BRIGHTNESS)



FEB. 20, 1950

TUBE DEPARTMENT

92CM - 7453

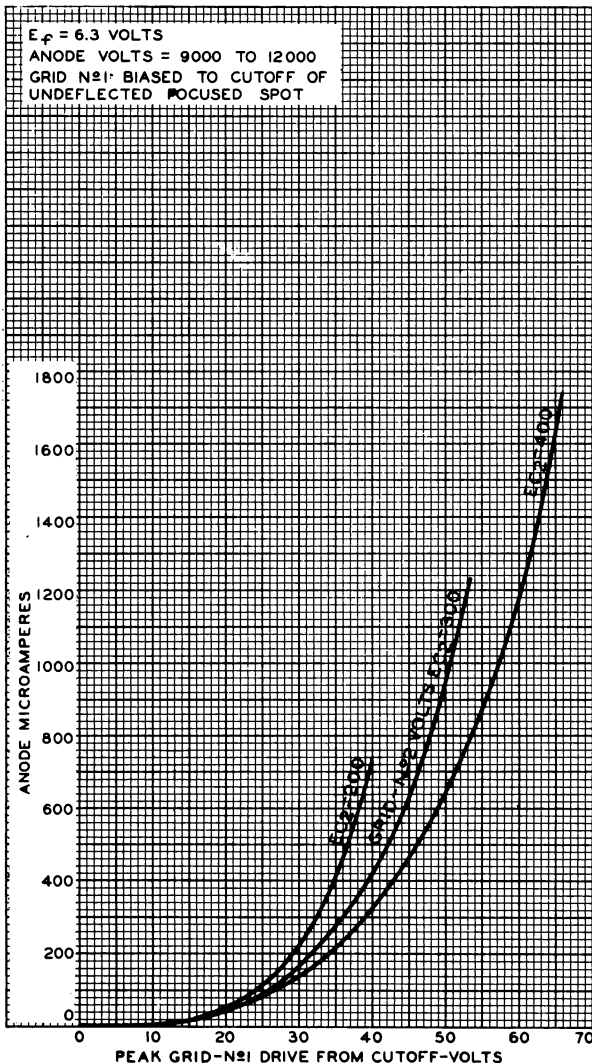
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12LP4-A



12LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 23, 1950

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 7306R1



14EP4/14CP4

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

14EP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf
Cathode to all other electrodes 5 μf
External conductive coating to ultor $\begin{cases} 2000 \text{ max.} \\ 750 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 66%

Phosphor (For curves, see front of this section) . . P4—Sulfide Type

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $16-5/8" \pm 1/4"$

Greatest width $12-17/32" \pm 1/8"$

Greatest height $9-23/32" \pm 1/8"$

Diagonal $13-11/16" \pm 1/8"$

Neck length $7-5/16" \pm 1/8"$

Screen Dimensions (Minimum):

Greatest width $11-3/8"$

Greatest height $8-1/2"$

Diagonal $12-1/2"$

Projected area 93 sq. in.

Weight (Approx.) 10 lbs

Mounting Position Any

Cap. Recessed Small Cavity (JETEC No. J1-21)

Bulb J-109-1/2

Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

Basing Designation for BOTTOM VIEW 12N

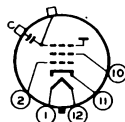
Pin 1—Heater

Pin 2—Grid No.1

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor
(Grid No.3,
Collector)
C—External
Conductive
Coating



14EP4

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	14000 max.	volts
GRID-No.2 VOLTAGE.	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3}) between 10000 and 14000 volts
and grid-No.2 voltage (E_{c2}) between 200 and 410 volts*

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.2 Current.	-15 to +15	μ amp
Focusing-Coil Current (DC) ⁰ .	$\left[\sqrt{\frac{E_{c3}}{14000}} \times 107 \right] \pm 10\%$	ma
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c3}}{14000}} \times 28$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§.	$\sqrt{\frac{E_{c3}}{14000}} \times 31$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>		12000	14000	volts
<i>and grid-No.2 voltage of</i>		300	300	volts
Grid-No.1 Voltage for				
Visual Extinction of				
Focused Raster	-28 to -72	-28 to -72		volts
Grid-No.1 Video Drive				
from Raster Cutoff				
(Black Level):				
White-level value				
(Peak positive)	28 to 72	28 to 72		volts
Focusing-Coil Current (DC) .	99 $\pm$ 10%	107 $\pm$ 10%		ma
Minimum Field Strength of				
PM Ion-Trap Magnet	29	31		gausses

* , 0 , ** , §: see next page.



14EP4

KINESCOPE

14EP4

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

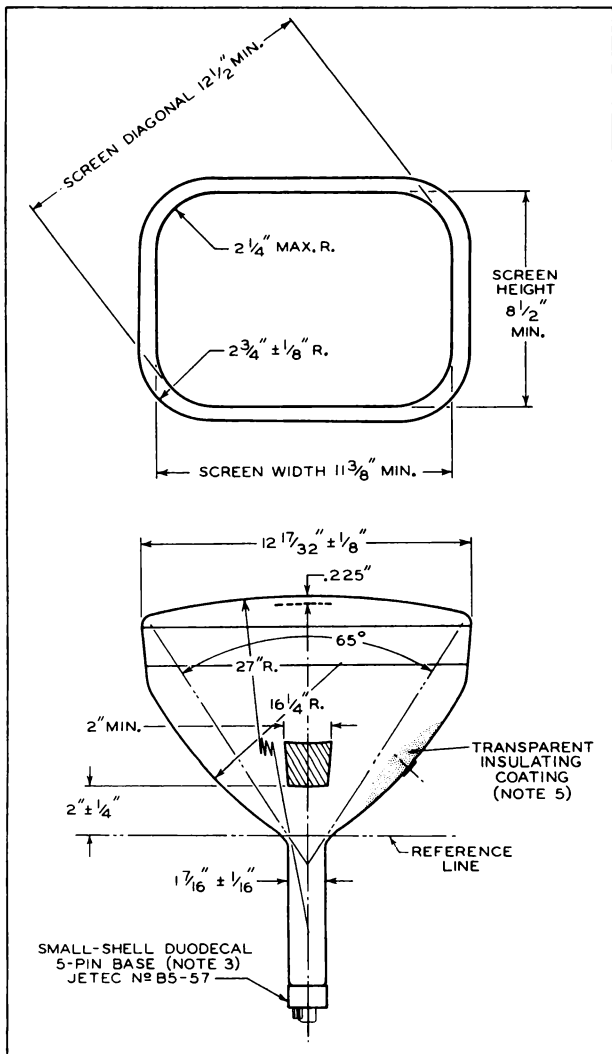
- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.
- For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (*See Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 11-1/8" x 8-5/16" picture size.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussess. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

14EP4



14EP4 KINESCOPE

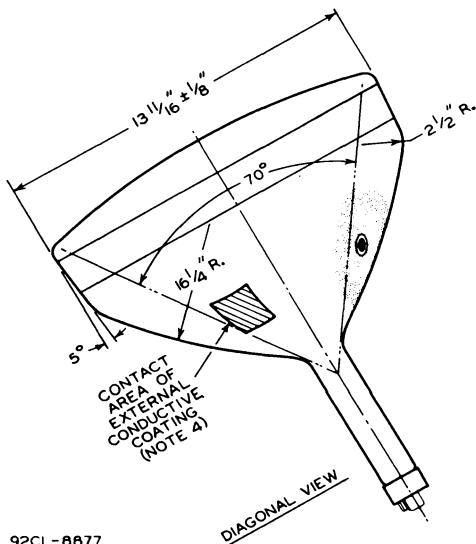
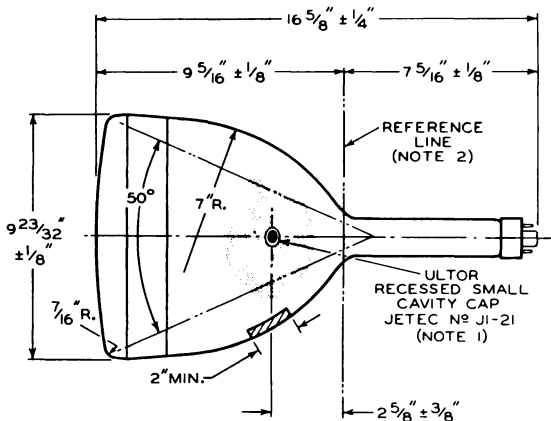




14EP4

KINESCOPE

14EP4



92CL-8877

14EP4



14EP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^{\circ}$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

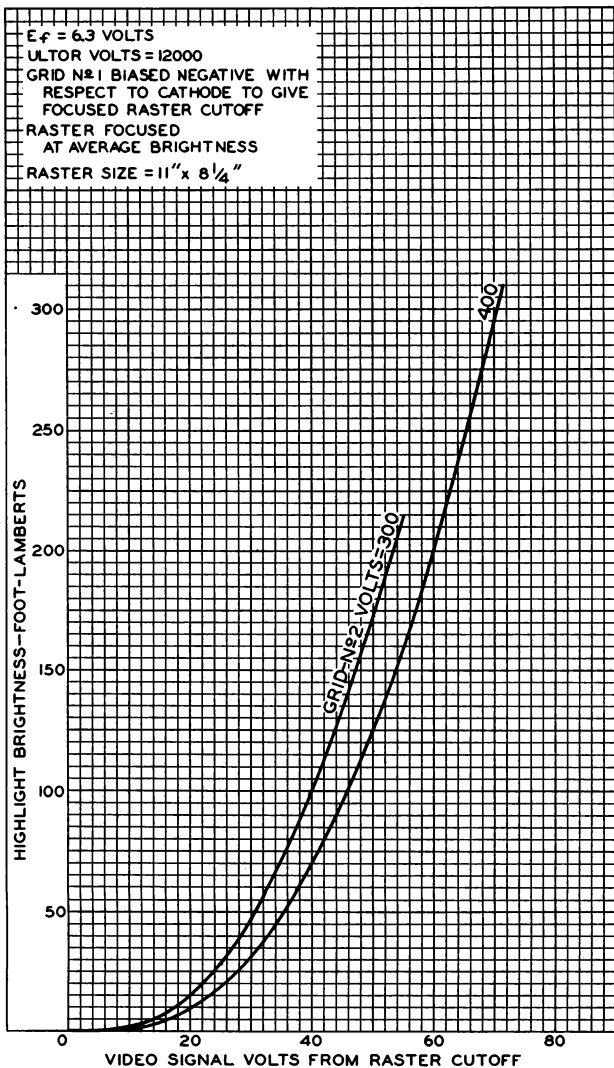
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.



14EP4

14EP4

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

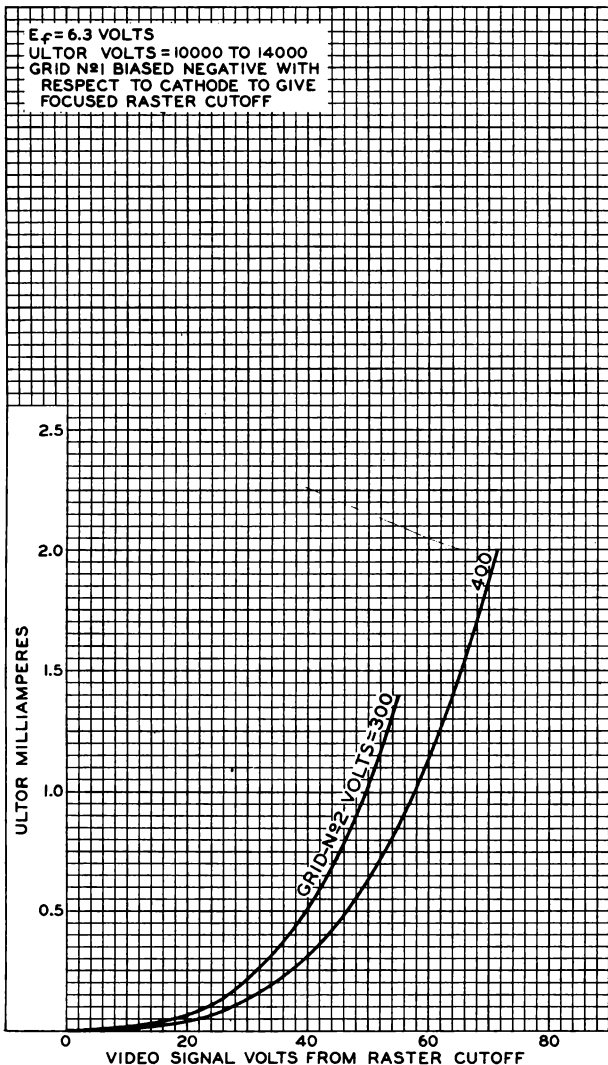
92CM-8859

14EP4



14EP4

AVERAGE GRID-DRIVE CHARACTERISTICS





14HP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

14HP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf

Cathode to all other electrodes. 5 μf

External conductive coating to ultor[•]. $\begin{cases} 2000 \text{ max.} \\ 750 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 75%

Phosphor (For Curves, see front of this Section). . P4—Sulfide Type

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $16-25/32" \pm 3/8"$

Greatest width $12-17/32" \pm 1/8"$

Greatest height. $9-23/32" \pm 1/8"$

Diagonal $13-11/16" \pm 1/8"$

Screen Dimensions (Minimum):

Greatest width $11-1/8"$

Greatest height. $8-5/16"$

Diagonal $12-1/4"$

Weight (Approx.) 10 lbs

Mounting Position. Any

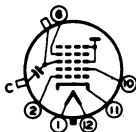
Cap. Recessed Small Cavity (JETEC No. J1-21)

Bulb J109-1/2

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

- Pin 1—Heater
- Pin 2—Grid No.1
- Pin 6—Grid No.4
- Pin 10—Grid No.2
- Pin 11—Cathode
- Pin 12—Heater



- Cap—Ultor
- (Grid No.3,
- Grid No.5,
- Collector)
- C—External
- Conductive
- Coating

[•]: See next page.

14HP4



14HP4

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR® VOLTAGE	14000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	500 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{C5}) between 12000 and 14000 volts
and grid-No.2 voltage (E_{C2}) between 200 and 500 volts*

Grid-No.4 Voltage for Focus with Ultor Current of 100 μ amp	-0.4% to +2.2% of E_{C5}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{C2}	volts
Grid-No.4 Current.	-25 to +25	μ amp
Grid-No.2 Current.	-15 to +15	μ amp
Field Strength of Single-Field Ion-Trap Magnet (Approx.).	$\sqrt{\frac{E_{C5}}{12000}} \times 32$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

<i>For ultor voltage of</i>	<i>12000</i>	<i>14000</i>	<i>volts</i>
<i>and grid-No.2 voltage of</i>	<i>300</i>	<i>300</i>	<i>volts</i>
Grid-No.4 Voltage for Focus with Ultor Current of 100 μ amp	-50 to +265	-55 to +310	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Field Strength of Ion-Trap Magnet.	32	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

*: See next page.

NOV. 5, 1954

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



14HP4

KINESCOPE

14HP4

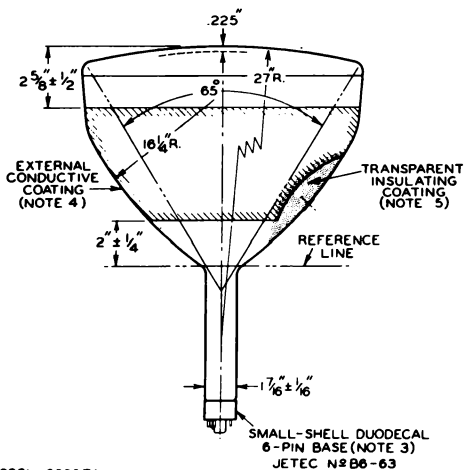
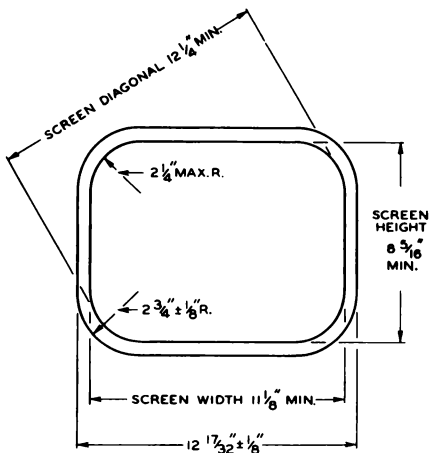
- The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 14HP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 14HP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.
- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

*For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

14HP4



14HP4 KINESCOPE



92CL-8335R1

NOV. 5, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

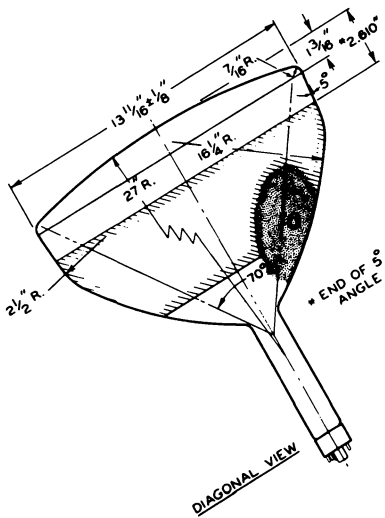
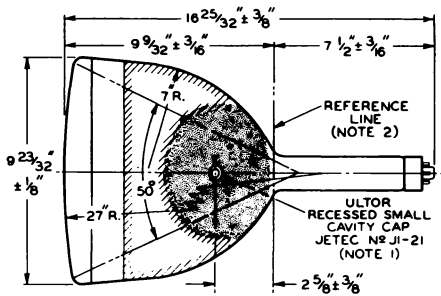
CE-8335R1A



14HP4

KINESCOPE

14HP4



14HP4



14HP4 KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

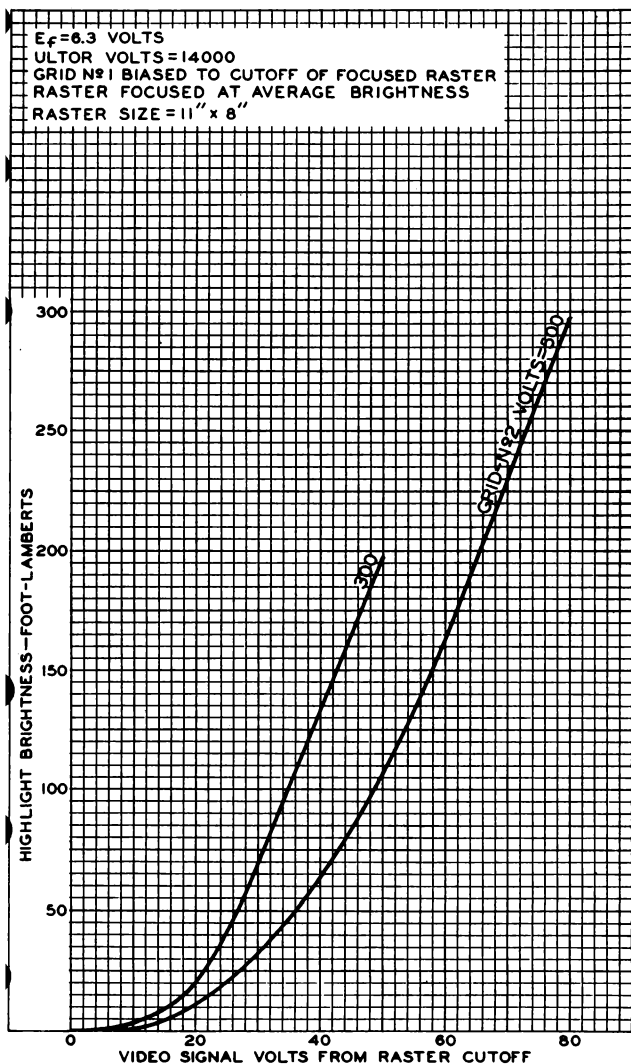
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT, DRY, LINTLESS CLOTH.



14HP4

14HP4

AVERAGE GRID-DRIVE CHARACTERISTICS



AUG. 19, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

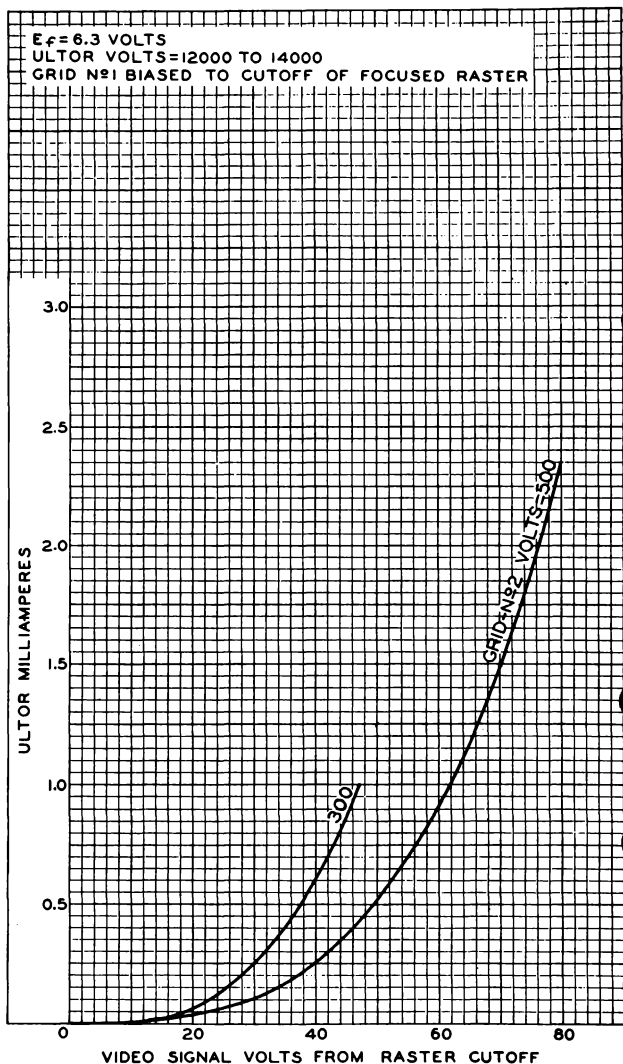
92CM-8392

14HP4



14HP4

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 27, 1954

TUBE DIVISION

92CM-8470

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



15GP22

15GP22

TRICOLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE
ELECTROSTATIC CONVERGENCEELECTROSTATIC FOCUS
MAGNETIC DEFLECTION

DATA

General:

Electron Guns, Three	Blue, Green, Red	
Heater, for Unipotential Cathode of Each Gun, Paralleled with Each of the Other Two Heaters within Tube:		
Voltage (AC or DC)	6.3	volts
Current	1.8	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 of Any Gun to All Other Electrodes Except the No.1 Grids of the Other Two Guns	7.5	μf
Cathode of Blue Gun + Cathode of Green Gun + Cathode of Red Gun to All Other Electrodes	17.5	μf
Grid No.3 (Of Each Gun Tied within Tube to No.3 Grids of Other Two Guns) to All Other Electrodes	12	μf
Grid No.4 (Common to the Three Guns) to All Other Electrodes	7	μf
External Conductive Coating to Ultor	{ 3000 max. 1500 min.	μf μf
Faceplate, Spherical	Clear Glass	
Screen, Flat:		
Type	Metal-Backed, Tricolor, Phosphor-Dot	
Plate	Filterglass	
Light Transmission (Approx.)	70%	
Size (Rounded Sides—See Dimensional Outline)	11-1/2" x 8-5/8"	
Area	88.5 sq. in.	
Phosphor (Three Separate Phosphors, collectively)	P22	
Fluorescence and Phosphorescence of Separate Phosphors, respectively	Blue, Green, Red	
Persistence of Group Phosphorescence	Medium	
Dot Arrangement	Approx. 195,000 triangular groups, each consisting of blue dot, green dot, and red dot (total of 585,000 dots)	
Focusing Method	Electrostatic	
Convergence Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Horizontal	45°	
Vertical	35°	
Tube Dimensions:		
Maximum Overall Length	26-1/8"	
Greatest Diameter:		
At faceplate	14-5/8" $\pm$ 5/32"	
At metal flange	15-3/4" max.	
Weight	25 lbs	

MARCH 1, 1954

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

15GP22



15GP22

TRICOLOR KINESCOPE

Mounting Position Any
 Ultor* Terminal Metal Flange
 Bulb J126
 Base Small-Shell Bidecal 14-Pin (JETEC No.B14-103)

BOTTOM VIEW

Pin 1: Heater	Pin 9: Grid No.2
Pin 2: Cathode	of Green Gun
of Red Gun	Pin 13: Grid No.4
Pin 3: Grid No.1	Pin 17: Grid No.2
of Red Gun	of Blue Gun
Pin 4: Grid No.2	Pin 18: Grid No.1
of Red Gun	of Blue Gun
Pin 5: No	Pin 19: Cathode of
Connection	Blue Gun
Pin 6: Grids No.3	Pin 20: Heater
Pin 7: Cathode	Metal Flange: Ultor
of Green Gun	(Grid No.5,
Pin 8: Grid No.1	Grid No.6,
of Green Gun	Collector)



Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE	20000 max. volts
ULTOR INPUT	15*max. watts
GRID-No.4 VOLTAGE	11000 max. volts
GRID-No.3 VOLTAGE	5000 max. volts
GRID-No.2 VOLTAGE (Each Gun).	500 max. volts
GRID-No.1 VOLTAGE (Each Gun):	
Negative bias value	200 max. volts
Positive bias value	0 max. volts
Positive peak value	2 max. volts
PEAK HEATER-CATHODE VOLTAGE (Each Gun):	
Heater negative with respect to cathode:	
During equipment warm-up period	
not exceeding 15 seconds	410 max. volts
After equipment warm-up period	180 max. volts
Heater positive with respect to cathode	180 max. volts

Equipment Design Ranges:

For ultor voltage (E_{c5}) of 18000 to 20000 volts

Grid-No.4 (Converging	
Electrode) Voltage†	42.5% to 51% of E_{c5} volts
Grid-No.3 (Focusing	
Electrode) Voltage	12% to 19% of E_{c5} volts

* The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 15GP22, the ultor function is performed by grid No.5. Since grid No.5, grid No.6, and collector are connected together within the tube, they are collectively referred to simply as "ultor", for convenience in presenting data and curves.

† This value is the product of ultor voltage and average current measured at the ultor terminal with a dc ammeter.

† See next page.

MARCH 1, 1954

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



15GP22

15GP22

TRICOLOR KINESCOPE

Grid-No.2 Voltage (Each Gun) when circuit design utilizes grid-No.1 Voltage (E_{C1}) at fixed value for raster cutoff (each gun) . . .			2 to 4.5 times E_{C1}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster (Each Gun) when circuit design utilizes grid-No.2 voltage (E_{C2}) at fixed value (each gun)			22.5% to 50% of E_{C2}	volts
Grid-No.4 Current			-5 to +5	μ amp
Maximum Grid-No.3 Current . . .			300	μ amp
Grid-No.2 Current			-15 to +15	μ amp
Beam-Current Ratio to Produce Illuminant-C White:				
Red Gun to Green Gun			4:1 to 1:1	
Blue Gun to Green Gun			1.5:1 to 0.5:1	
Maximum Raster Shift in Any Direction from Screen Center [□] . . .			1-1/4	inches

Examples of Use of Design Ranges:*For ultor voltage of 20000 volts*

Grid-No.4 (Converging Electrode) Voltage† . .			8500 to 10200	volts
Grid-No.3 (Focusing Electrode) Voltage . . .			2400 to 3800	volts
Grid-No.2 Voltage (Each Gun) when circuit design utilizes grid-No.1 voltage of -70 volts for raster cutoff (each gun) .			140 to 315	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster (Each Gun) when circuit design utilizes grid-No.2 voltage of 200 volts (each gun)			-45 to -100	volts

Circuit Values:

Grid-No.1-Circuit Resistance (Each Gun) . .			1.5 max.	megohms
Dynamic Converging Voltage (Approx.)** . .			900	volts
Dynamic Focusing Voltage (Approx.)** . . .			225	volts

† This range does not include the dc component of the dynamic converging voltage.

□ Centering of the raster on the screen is accomplished by passing direct current of the required value through each pair of deflecting coils to compensate for the raster shift resulting from optimum adjustments for convergence, color purity, and concentricity.

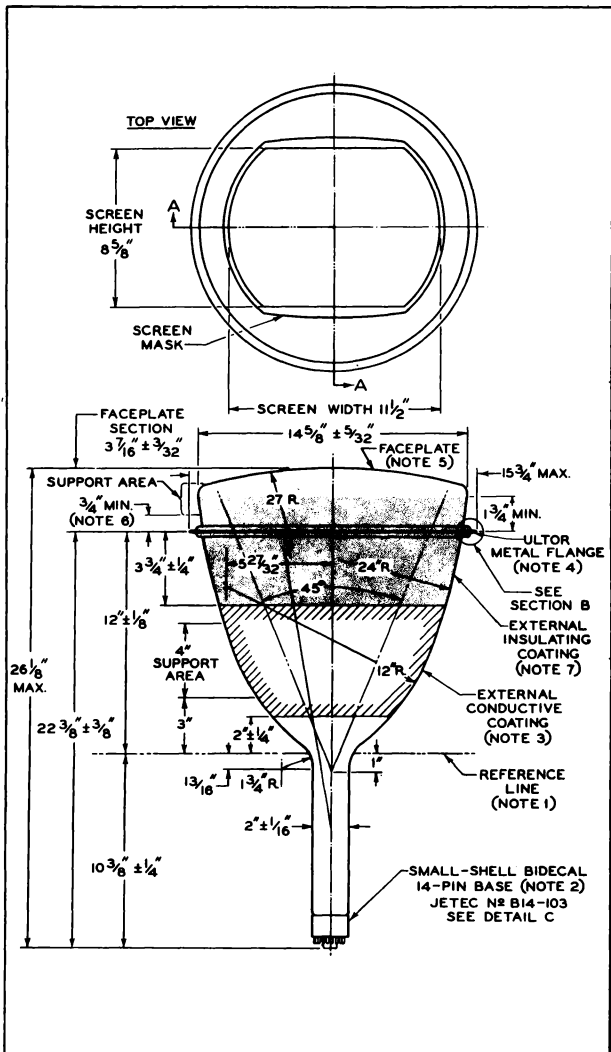
** Peak-to-peak value. This ac voltage having essentially parabolic waveform is synchronized with scanning and does not include any voltage developed during the blanking time.

15GP22



15GP22

TRICOLOR KINESCOPE



MARCH 1, 1954

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

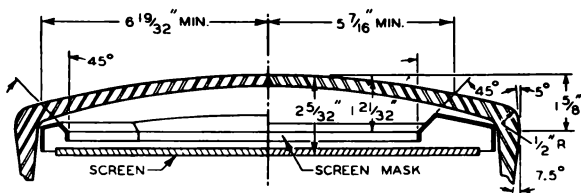
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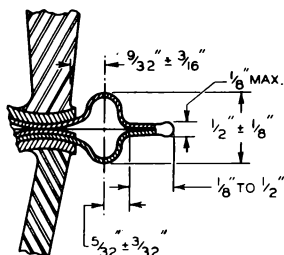
15GP22

15GP22

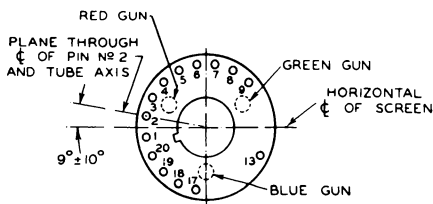
TRICOLOR KINESCOPE



ENLARGED SECTION A-A



ENLARGED SECTION B



BASE DETAIL C
BOTTOM VIEW

92CL - 8072R1

15GP22



15GP22

TRICOLOR KINESCOPE

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE 2.400" $\pm$ 0.001" I.D. WHICH IS HELD CONCENTRIC WITH TUBE NECK AXIS WILL REST ON FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH FACEPLATE-SECTION AXIS AND HAVING A DIAMETER OF 3".

NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 4: METAL FLANGE OPERATES AT HIGH VOLTAGE. ADEQUATE INSULATION MUST BE PROVIDED BETWEEN THE FLANGE AND ANY GROUNDED ELEMENT IN THE RECEIVER TO PREVENT THE POSSIBILITY OF ELECTRICAL LEAKAGE INCLUDING CORONA.

NOTE 5: MASK MATERIAL BEARING ON THE FACEPLATE MUST HAVE INSULATING QUALITIES ADEQUATE FOR ONE HALF THE APPLIED ULTOR VOLTAGE TO MINIMIZE SURFACE LEAKAGE BETWEEN METAL FLANGE AND MASK.

NOTE 6: TUBE SHOULD NOT BE SUPPORTED IN THIS AREA.

NOTE 7: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.



15GP22

15GP22

TYPICAL DRIVE CHARACTERISTIC

$E_f = 6.3$ VOLTS

ULTOR (GRIDS-N $\circ$ 5 & N $\circ$ 6 AND COLLECTOR) VOLTS=20000

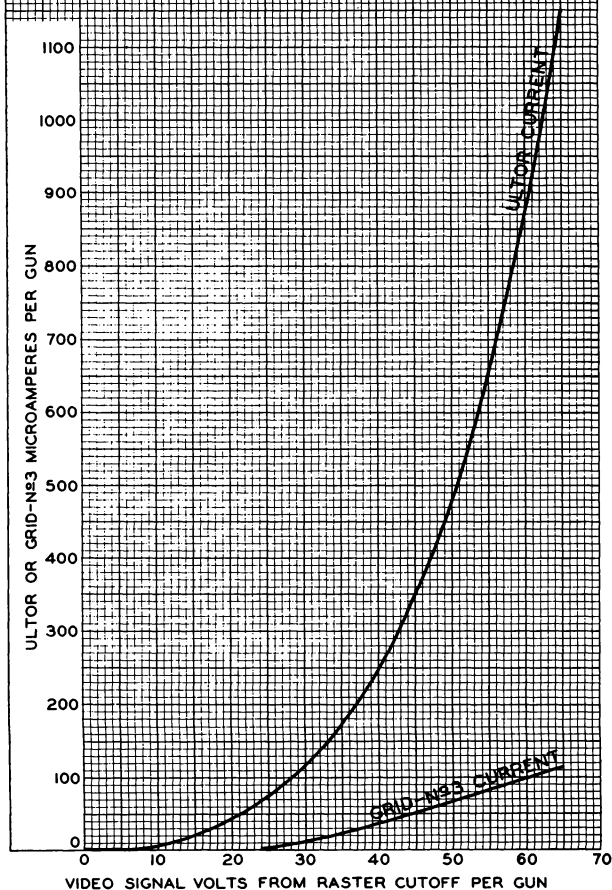
GRID-N $\circ$ 4 VOLTS=ADJUSTED FOR CONVERGENCE

GRID-N $\circ$ 3 VOLTS=ADJUSTED FOR FOCUS

GRID-N $\circ$ 2 VOLTS OF EACH GUN=200

GRID-N $\circ$ 1 OF EACH GUN IS BIASED TO RASTER CUTOFF

RASTER SIZE $11\frac{1}{2}'' \times 8\frac{5}{8}''$



SEPT. 3, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

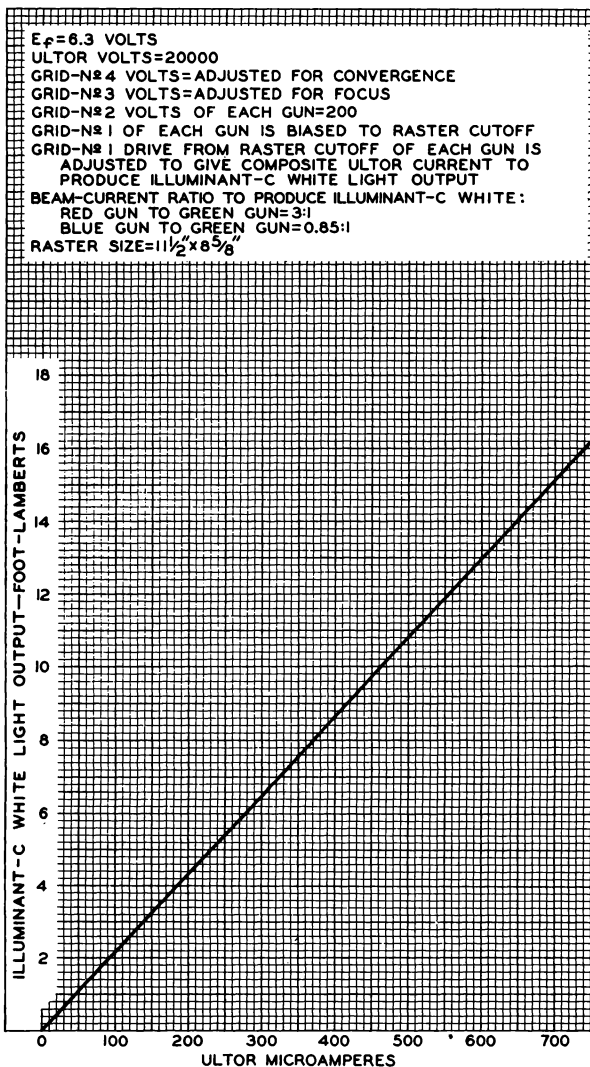
92CM-8067

15GP22



15GP22

TYPICAL LIGHT-OUTPUT CHARACTERISTIC



JAN. 13, 1954

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8073R1



16ADP7

OSCILLOGRAPH TUBE

METAL-SHELL ENVELOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 6 μ mf

Cathode to All Other Electrodes 5 μ mf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 66%

Phosphor (For Curves, see front of this Section). P7

Fluorescence. Blue

Persistence Short

Phosphorescence Greenish-Yellow

Persistence Long

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.) 53°

Maximum Overall Length. 22"

Greatest Diameter at Lip. 15-7/8" + 1/8"

Minimum Useful Screen Diameter. 14-3/8"

Ultor* Terminal Metal-Shell Lip

Mounting Position Any

Base. Small-Shell Duodecal 7-Pin (JETEC No. B7-51)

BOTTOM VIEW

Pin 1-Heater

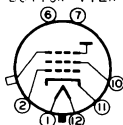
Pin 2-Grid No.1

Pin 6-No

Connection

Pin 7-No

Connection



Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater

Cap-Ultor

(Grid No.3,

Collector)

Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE 14000 max. volts

GRID-No.2 VOLTAGE:

Positive value (DC or Peak AC). 410 max. volts

Negative value (DC or Peak AC). 180 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 180 max. volts

Positive bias value ϕ 0 max. volts

Positive peak value 2 max. volts

PEAK GRID-No.1 DRIVE FROM CUTOFF. 65 max. volts

* In the 16ADP7, grid No.3 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

ϕ At or near this rating, the effective resistance or the ultor supply should be adequate to limit the ultor input power to 6 watts.

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

16ADP7



16ADP7 OSCILLOGRAPH TUBE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode .	125 max.	volts
Heater positive with respect to cathode .	125 max.	volts

Typical Operation:

Ultor Voltage*	12000	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-27 to -63	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC) ^{oo}	95 $\pm$ 15%	ma
Spot Position	##	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
---------------------------------------	----------	---------

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 8000 volts.

^{oo} For specimen focusing coil similar to JETEC Focusing coil No.109 positioned with air gap toward faceplate and center line of air gap 3-1/4" from Reference Line (see Outline Drawing) and ultor current of 200 microamperes.

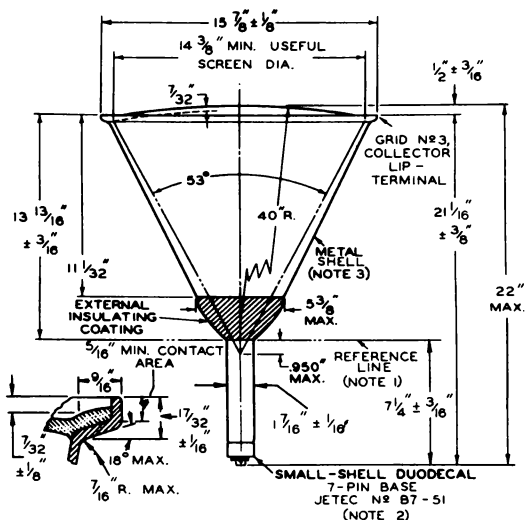
The center of the undeflected, unfocused spot will fall within a circle having 25-mm radius concentric with the center of the tube face.



16ADP7

OSCILLOGRAPH TUBE

16ADP7



NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No. 112) $1.500" \pm 0.003"$ - $0.000"$ I.D. AND 2" LONG WILL REST ON FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING DIAMETER OF 3".

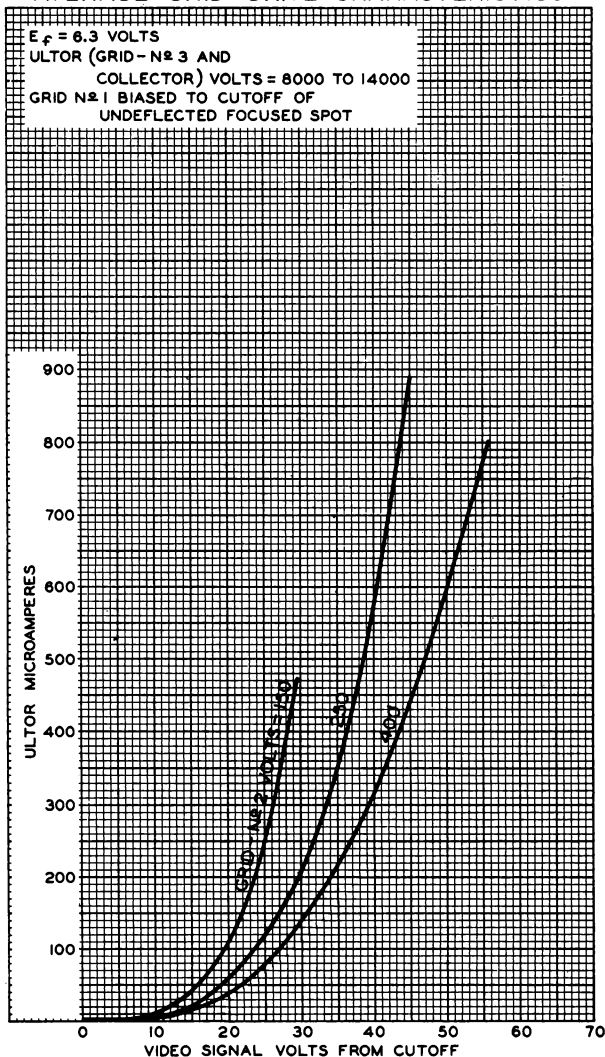
NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTIO VOLTAGE.

16ADP7



16ADP7

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 5, 1951

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7692



16AP4-A

KINESCOPE

METAL-CONE ENVELOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

Supersedes Type 16AP4

16AP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 6 $\mu\mu\text{f}$

Cathode to All Other Electrodes 5 $\mu\mu\text{f}$

Face Plate (Transmission of about 65%) . . . RCA "Filterglass"

Phosphor (For Curves, see front of this Section) No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Medium

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.) 53°

Ion-Trap Gun Requires External Double-Field Magnet

Maximum Overall Length 22-5/16"

Greatest Diameter of Bulb 15-7/8" $\pm 1/8$ "

Screen Diameter 14-5/8"

Mounting Position Any

Anode Terminal Metal-Cone Lip

Base Small-Shell Duodecal 5-Pin

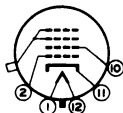
Basing Designation for BOTTOM VIEW 12D1

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2

Pin 11-Cathode



Pin 12-Heater

Metal-Cone Lip:

Anode,

Grid No.3

Maximum Ratings, Design-Center Values:

ANODE^oVOLTAGE^o 14000 max. volts

GRID-No.2 VOLTAGE 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds . . . 410 max. volts

After equipment warm-up period . . . 150 max. volts

Heater positive with respect to cathode. 150 max. volts

^o Anode and grid No.3, which are connected together within tube, are referred to herein as anode.

^o The product of anode voltage and average anode current should be limited to 6 watts.

16AP4-A



16AP4-A KINESCOPE

Typical Operation:

Anode Voltage*	9000	12000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC)†.	75	90	ma
Ion-Trap Magnet Current (DC, approx.)‡	155	200	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max. megohms
---------------------------------------	------------------

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 ma. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance.	150 min.	ohms
Grid-No.2-Circuit Resistance.	470 min.	ohms
Anode-Circuit Resistance	16000 min.	ohms

The resistors used should be capable of withstanding the applied voltage.

Components:

Horizontal-Deflection-Output and High-Voltage Transformer:

For use with pulse-operated high-voltage supply

giving 11500-13500 volts RCA- 211T5

Horizontal Linearity Control RCA- 201R5

Width Control. RCA- 201R4

Vertical-Deflection Output Transformer RCA- 204T9

Deflecting Yoke. RCA-201D12

Ion-Trap Magnet (Permanent-Magnet Type). RCA- 203D3

Focusing Coil‡. RCA- 202D2

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 9000 volts.

† For JETEC Focusing Coil No.109, or equivalent, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 13-1/4" x 10" picture area.

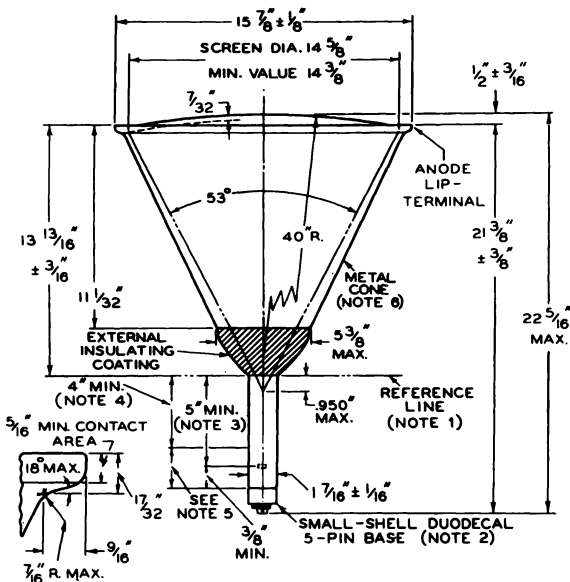
‡ For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give maximum brightness.

‡‡ Renewal Sales item only.



16AP4-A KINESCOPE

16AP4-A



DETAIL OF LIP

92CM-7449

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON CONE.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH CONE AXIS AND HAVING DIAMETER OF 3".

NOTE 3: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH VACANT PIN POSITION No.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.6 AND SOUTH POLE TO PIN No.12.

NOTE 4: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL MUST BE WITHIN THIS SPACE.

16AP4-A



16AP4-A KINESCOPE

NOTE 5: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 6: METAL CONE AND GLASS FACE OPERATE AT HIGH VOLTAGE.
ANY MATERIAL IN CONTACT WITH THE CONE OR THE FACE
MUST HAVE INSULATING PROPERTIES ADEQUATE FOR 15500 VOLTS.

CURVES

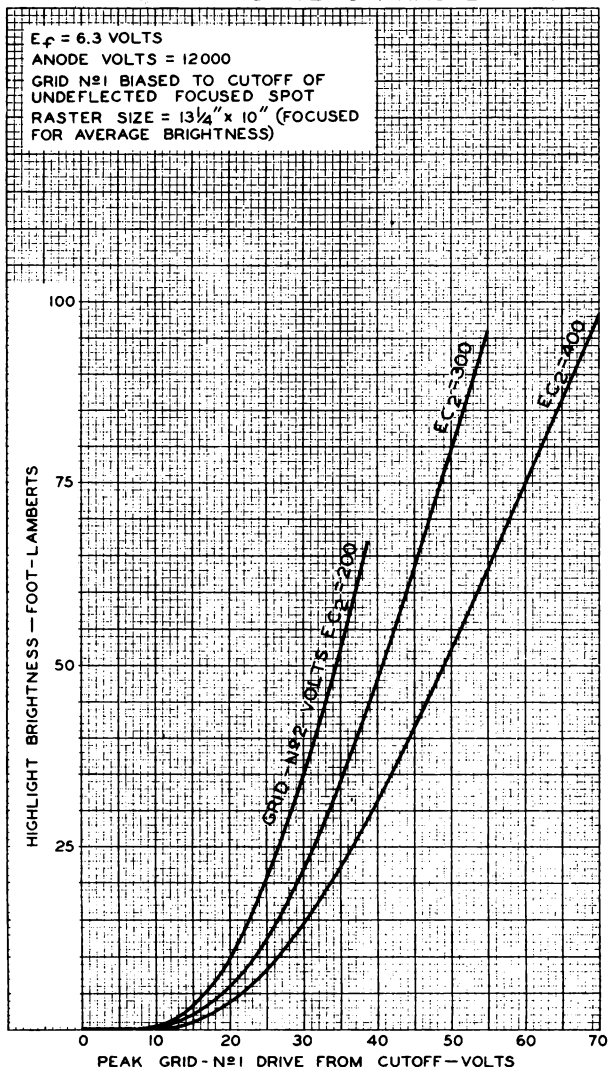
The following Grid-Drive Characteristics Curves are for the condition with grid No.1 biased to give visual extinction of the undeflected, focused spot. In viewing television pictures, it will be found that the actual cutoff voltage corresponding to black in the picture is approximately 5 volts less negative than shown on the curves; similarly, the grid-No.1 drive to obtain a given anode current or light output is also about 5 volts less.



16AP4-A

16AP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 22, 1950

TUBE DEPARTMENT

92CM-7471

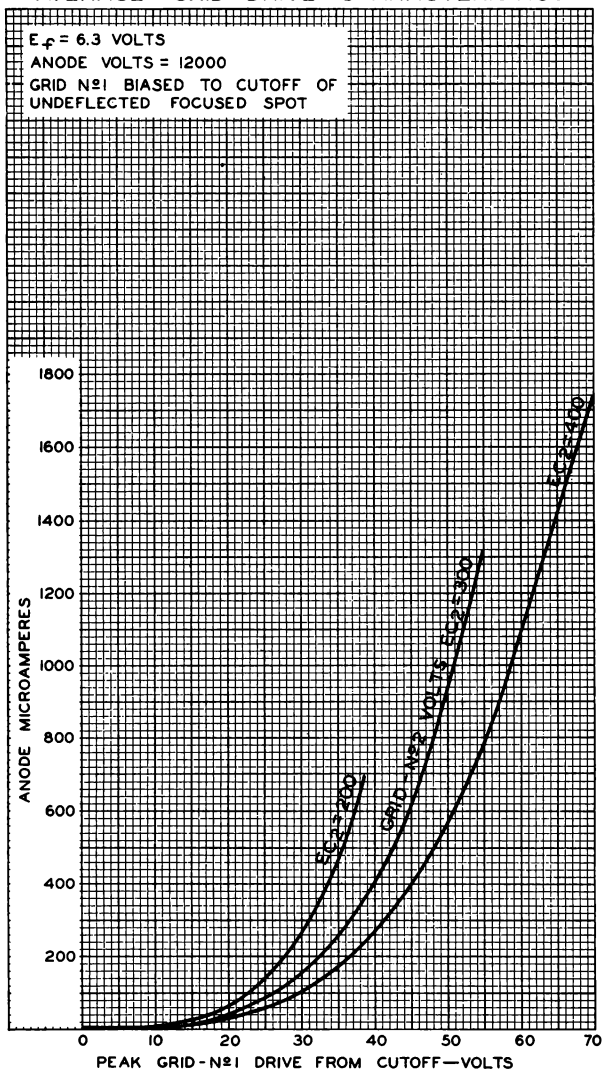
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16AP4-A



16AP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 25, 1950

TUBE DEPARTMENT

92CM - 6999RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



16DP4-A KINESCOPE

ROUND GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

16DP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf

Cathode to All Other Electrodes. 5 μf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 66%

Phosphor (For Curves, see front of this Section). P4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 60°

Ion-Trap Gun Requires External Double-Field Magnet

Overall Length 20-3/4" $\pm$ 1/4"

Greatest Diameter of Bulb. 15-7/8" $\pm$ 1/8"

Minimum Screen Diameter. 14-1/2"

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No. J1-21)

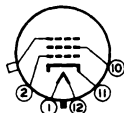
Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

BOTTOM VIEW

Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2



Pin 11 - Cathode

Pin 12 - Heater

Cap - Anode

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE. 15000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds . . . 410 max. volts

After equipment warm-up period . . . 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation:

Anode Voltage* 12000 volts

*Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 9000 volts.

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

16DP4-A



16DP4-A KINESCOPE

Grid-No.2 Voltage.	250	volts
Grid-No.1 Voltage ^o	-27 to -63	volts
Focusing-Coil Current (DC, Approx.)† . .	115	ma
Ion-Trap-Magnet Current (DC, Approx.)# .	110	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

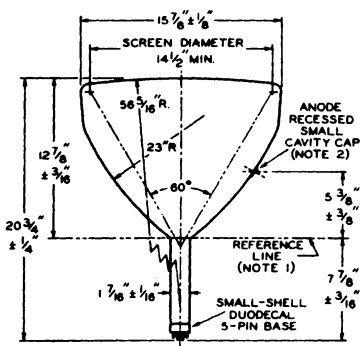
^o For visual extinction of undeflected, focused spot.

† For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3-1/4 inches from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 14-1/2" x 10-1/4" picture area sharply focused at center of screen.

For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.108 located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

X-Ray Warning. When operated at anode voltages up to 16 kilovolts, the 16DP4-A does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 16.5 kilovolts (absolute value), shielding of the 16DP4-A for x-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.



NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) 1.500" + 0.003" - 0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 2: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA



16GP4-B

KINESCOPE

ROUND METAL-SHELL TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

16GP4-B

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp ←

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf

Cathode to all other electrodes. 5 μf

Faceplate, Spherical Frosted Filterglass

Light transmission (Approx.) 66% ←

Phosphor (For curves, see front of this section). P4—Sulfide Type

Fluorescence White

Phosphorescence. White

Persistence. Short ←

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 70°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Maximum overall length 17-11/16"

Greatest diameter. $15-7/8" \pm 1/8"$

Minimum Useful Screen Diameter $14-3/8"$ ←

Weight (Approx.) 11 lbs ←

Mounting Position Any

Ultor Terminal Metal-Shell Lip

Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57) ←

Basing Designation for BOTTOM VIEW 12D ←

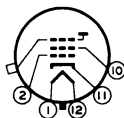
Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Metal-Shell Lip -

Ultor

(Grid No.3,

Collector)

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE. 14000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds 410 max. volts

After equipment warm-up period 150 max. volts

Heater positive with respect to cathode. 150 max. volts

← Indicates a change.



16GP4-B

KINESCOPE

Equipment Design Ranges:

With any ultor voltage (E_{c3}) between 12000* and 14000 volts
and grid-No.2 voltage (E_{c2}) between 200 and 410 volts

Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC) ^o . .	$\left[\sqrt{\frac{E_{c3}}{14000}} \times 107 \right] \pm 10\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c3}}{14000}} \times 28$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c3}}{14000}} \times 31$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	12000	volts
and grid-No.2 voltage of	300	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	28 to 72	volts
Focusing-Coil Current (DC) . .	99 $\pm$ 10%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	29	gausses

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

^o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (See *Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 10" x 13-1/4" picture size.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ See next page.

→ Indicates a change.



16GP4-B KINESCOPE

16GP4-B

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

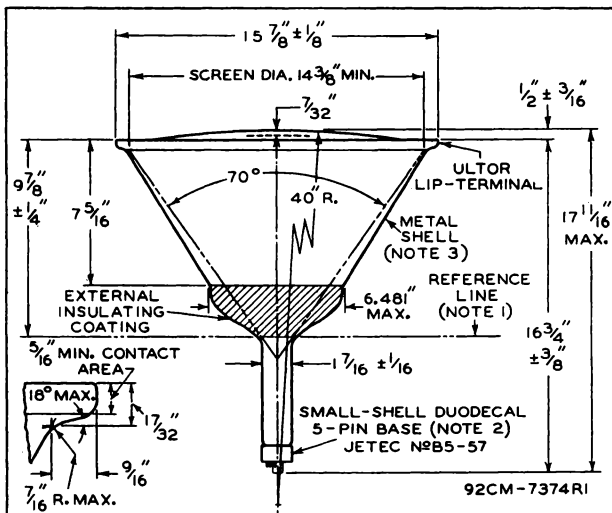
§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

16GP4-B



16GP4-B KINESCOPE



DETAIL OF LIP

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

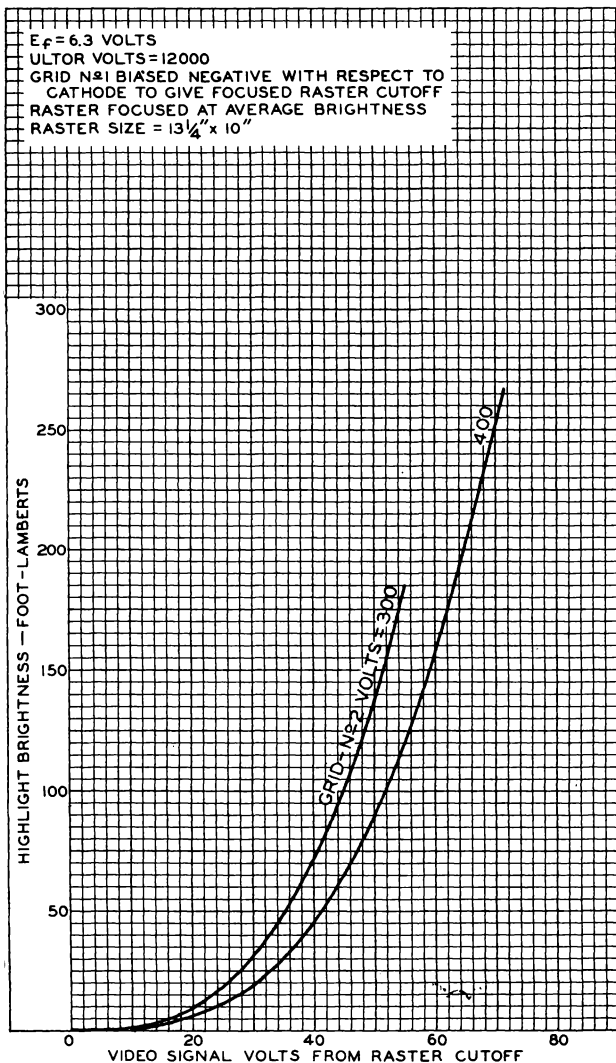
NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.



16GP4-B

16GP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS

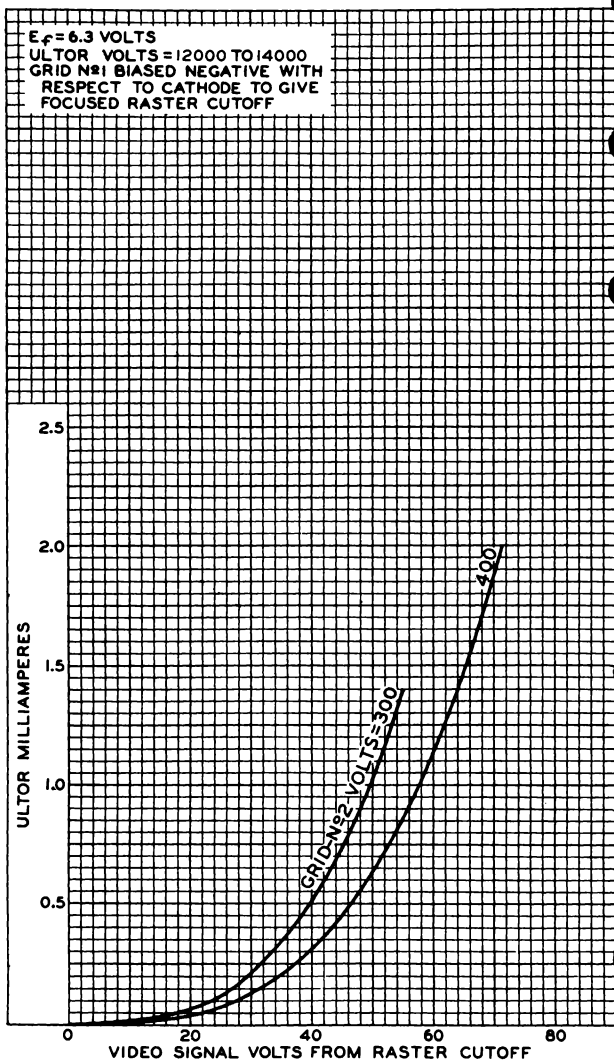


16GP4-B



16GP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS





16LP4-A KINESCOPE

ROUND GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

16LP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3' ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 6 μf

Cathode to All Other Electrodes. 5 μf

External Conductive Coating to Anode. { 2000 max. μf
750 min. μf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 66%

Phosphor (For Curves, see front of this Section). P4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.) 52°

Ion-Trap Gun Requires External Double-Field Magnet

Overall Length 22-1/4" $\pm$ 3/8"

Greatest Diameter of Bulb. 15-7/8" $\pm$ 1/8"

Minimum Screen Diameter. 14-1/2"

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No. J1-21)

Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

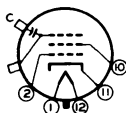
BOTTOM VIEW

Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode



Pin 12 - Heater

Cap - Anode

C - External
Conduct.
Coating

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE 14000 max. volts

GRID-No.2 VOLTAGE 410 max. volts

GRID-No.1 VOLTAGE :

Negative bias value 125 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not
exceeding 15 seconds. 410 max. volts

After equipment warm-up period. 125 max. volts

Heater positive with respect to cathode 125 max. volts

Typical Operation:

Anode Voltage 12000 volts

FEB. 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16LP4-A



16LP4-A KINESCOPE

Grid-No.2 Voltage.	300	volts
Grid-No.1 Voltage ^o	-33 to -77	volts
Focusing-Coil Current (DC, Approx.) [▲]	110	ma
Ion-Trap-Magnet Current (DC, Approx.) [#]	120	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

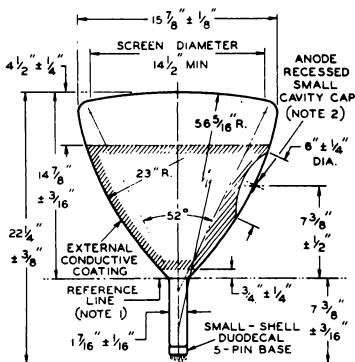
^o For visual extinction of undeflected focused spot.

[▲] For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward kinescope screen, and center line of air gap about $3\frac{1}{4}$ " inches from Reference Line (see Outline Drawing). The indicated current is for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a high-light brightness of 20 foot-lamberts on a $14\frac{1}{2}$ " x $10\frac{1}{4}$ " picture area sharply focused at center of screen.

[#] For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.106 located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

X-Ray Warning. When operated at or below the maximum anode-voltage rating shown in the tabulated data, the 16LP4-A does not produce any harmful x-ray radiation. All types of picture tubes may be operated at voltages (if ratings permit) up to 16 kilovolts (absolute value) without personal injury on prolonged exposure at close range. Above 16 kilovolts, special shielding precautions for x-ray radiation may be necessary.



NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC NO.112) $1.500" \pm 0.003" - 0.000"$ I.D. AND $2"$ LONG WILL REST ON BULB CONE.

NOTE 2: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION NO.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION NO.3.

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA



16RP4 / 16KP4

16RP4

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

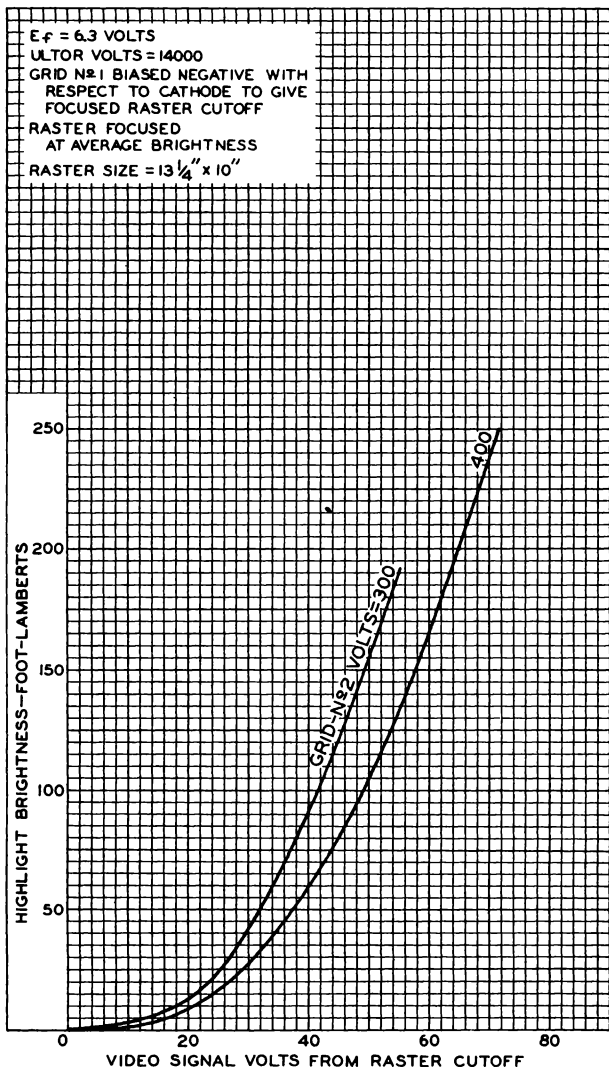
The 16RP4/16KP4 is the same as the 16RP4-A/16KP4-A except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

16RP4



16RP4

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8858



16RP4-A

16RP4-A/16KP4-A

KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUSALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf Cathode to all other electrodes. 5 μf External conductive coating to ultor $\begin{cases} 1500 \text{ max.} \\ 750 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 66%

Phosphor (For curves, see front of this section) . . P4--Sulfide Type
Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70° Horizontal 65° Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $18\text{-}3/4" \pm 3/8"$ Greatest width $14\text{-}3/4" \pm 1/8"$ Greatest height. $11\text{-}1/2" \pm 1/8"$ Diagonal $16\text{-}1/8" \pm 1/8"$ Neck length. $7\text{-}1/2" \pm 3/16"$

Screen Dimensions (Minimum): -

Greatest width $13\text{-}1/2"$ Greatest height. $10\text{-}1/8"$ Diagonal $14\text{-}7/8"$

Projected area 131 sq. in.

Weight (Approx.) 16 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J129

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

Basing Designation for BOTTOM VIEW 12N

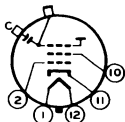
Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2

Pin 11-Cathode

Pin 12-Heater



Cap-Ultor

(Grid No.3,

Collector)

C-External

Conductive

Coating



I6RP4-A

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	16000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period.	150 max.	volts
Heater positive with respect to cathode .	150 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3}) between 12000* and 16000 volts
and grid-No.2 voltage (E_{c2}) between 200 and 410 volts

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC) ϕ	$\sqrt{\frac{E_{c3}}{16000}} \times 115 \pm 20\%$	ma
Ion-Trap Magnet Current	$\sqrt{\frac{E_{c3}}{16000}} \times 30$	ma
(Average) **		
Minimum Field Strength of	$\sqrt{\frac{E_{c3}}{16000}} \times 33$	gausses
PM Ion-Trap Magnet ϕ		
Field Strength of Adjustable	0 to 8	gausses
Centering Magnet.		

Examples of Use of Design Ranges:

With ultor voltage of		12000	14000	volts
and grid-No.2 voltage of		300	300	volts
Grid-No.1 Voltage for				
Visual Extinction of				
Focused Raster.	-28 to -72	-28 to -72		volts
Grid-No.1 Video Drive				
from Raster Cutoff				
(Black Level):				
White-level value				
(Peak positive)	28 to 72	28 to 72		volts
Focusing-Coil Current (DC). .	100 $\pm$ 20%	108 $\pm$ 20%		ma
Minimum Field Strength of	29	31		gausses
PM Ion-Trap Magnet.				

* , ϕ , ** , ϕ : see next page.



16RP4-A

KINESCOPE

16RP4-A

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

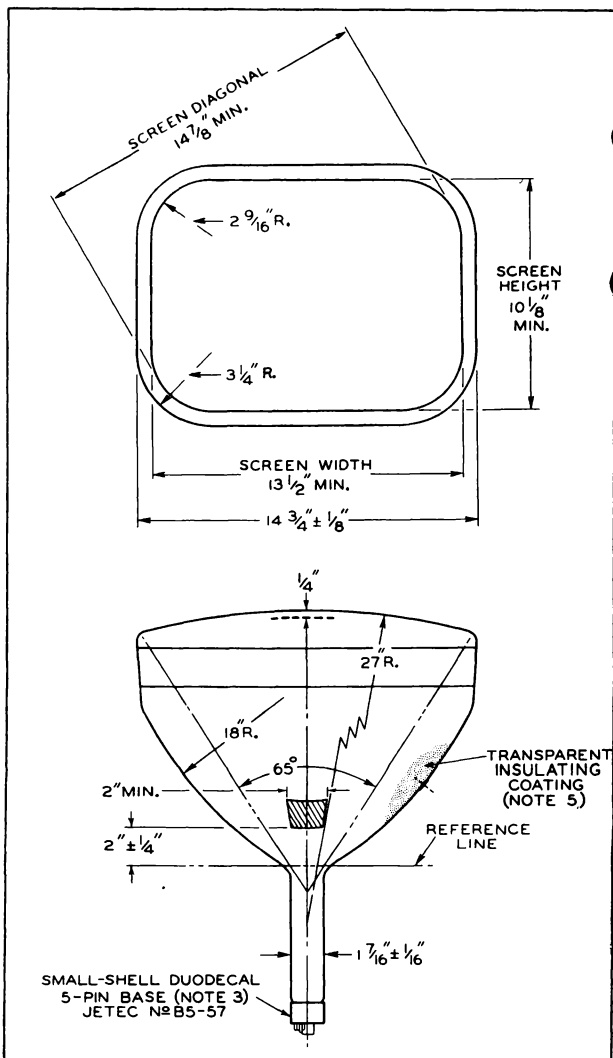
- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.
- For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3-1/2 inches from Reference Line (*See Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 13-1/2" x 10-1/8" picture size.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussess. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

16RP4-A



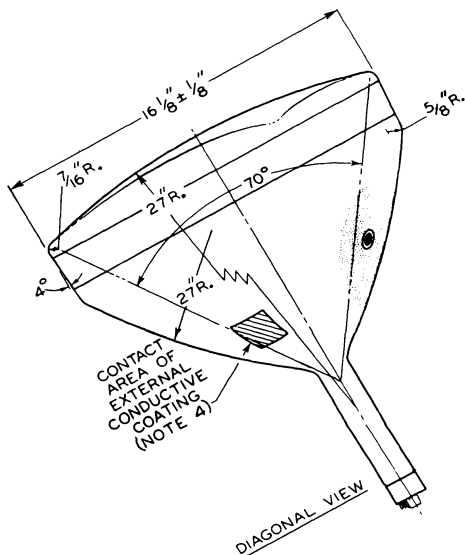
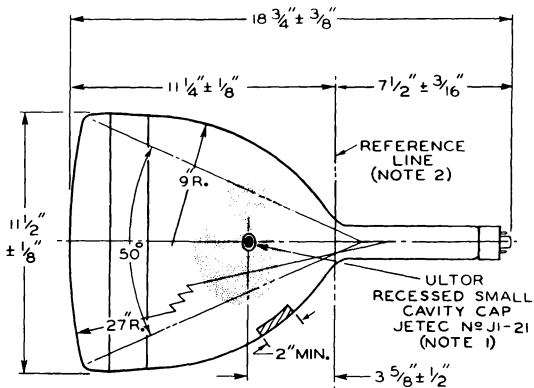
16RP4-A KINESCOPE





16RP4-A KINESCOPE

16RP4-A



92CL-8878

16RP4-A



16RP4-A KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

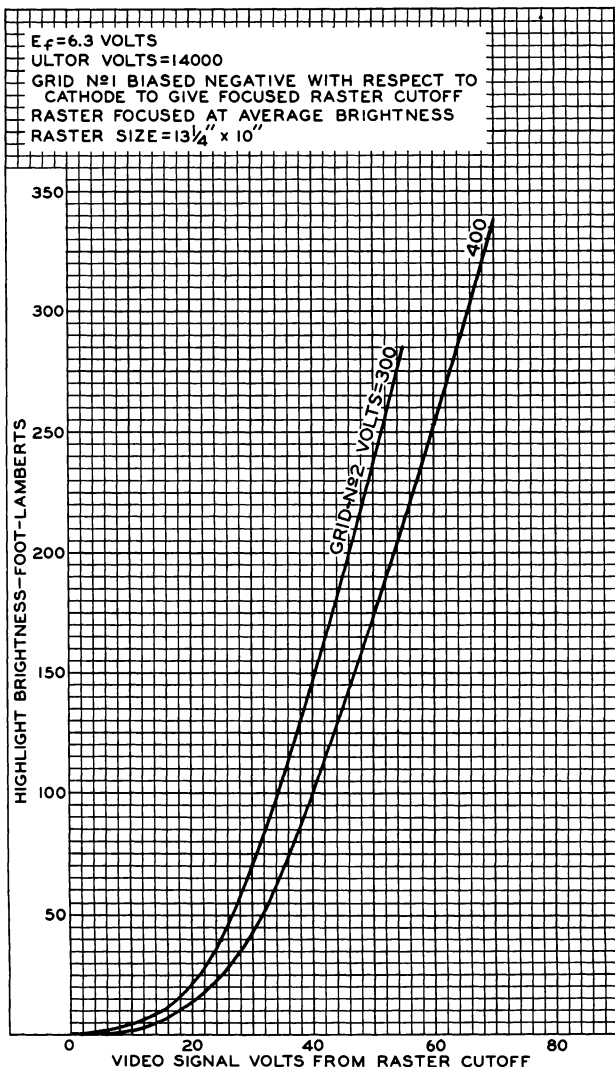
NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.



16RP4-A

16RP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

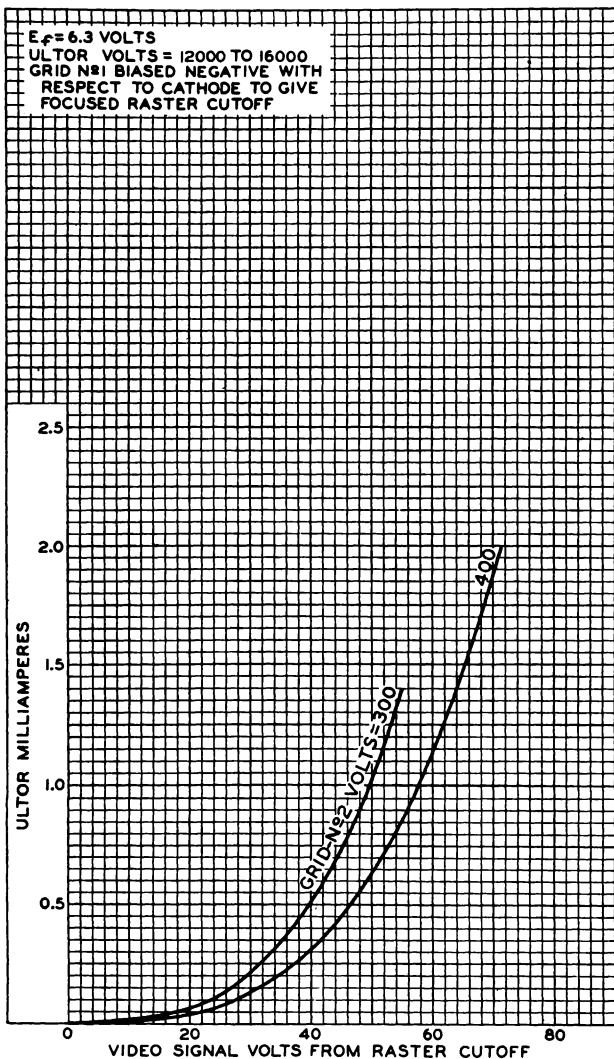
92CM-8857

16RP4-A



16RP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS





I6WP4-A KINESCOPE

ROUND GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

16WP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 6 μf

Cathode to All Other Electrodes. 5 μf

External Conductive Coating to Anode $\begin{cases} 1500 \text{ max.} \\ 750 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light Transmission 66%

Phosphor (For Curves, see front of this Section) P4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 70°

Ion-Trap Gun Requires External Double-Field Magnet

Overall Length 17-3/4" $\pm$ 3/8"

Greatest Diameter of Bulb. 15-7/8" $\pm$ 1/8"

Minimum Screen Diameter. 14-1/2"

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No. J1-21)

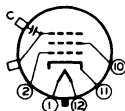
Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2

Pin 11-Cathode



Pin 12-Heater

Cap-Anode

C-External
Conduct.
Coating

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE. 16000 max. volts

GRID-No.2 VOLTAGE 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 125 max. volts

Heater positive with respect to cathode. 125 max. volts

Typical Operation

Anode Voltage. 12000 volts

Grid-No.2 Voltage. 250 volts

FEB. 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16WP4-A



16WP4-A KINESCOPE

Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot.	-27 to 63	volts
Focusing-Coil Current (DC, Approx.) ^o	100	ma
Ion-Trap Current (Approx.) [†]	120	ma

Maximum Circuit Values:

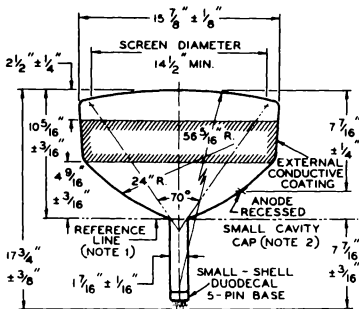
Grid-No.1-Circuit Resistance	1.5 max.	megohms
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^o For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward kinescope screen and center line of air gap 3-1/4 inches from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 14-1/2" x 10-1/4" picture area sharply focused at center of screen.

[†] For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.108 located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

X-Ray Warning. When operated at anode voltages up to 16 kilovolts, the 16WP4-A does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at anode voltages as high as 17.6 kilovolts (absolute value), shielding of the 16WP4-A for x-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.



NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.



17AVP4/17ATP4 KINESCOPE

17AVP4

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μmf

Cathode to all other electrodes. 5 μmf

External conductive coating to ultor. $\begin{cases} 1500 \text{ max.} \\ 1200 \text{ min.} \end{cases}$ μmf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 74%

Phosphor (For curves, see front of this section) . P4—Sulfide Type

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $15-5/8" \pm 3/8"$

Greatest width $15-25/64" \pm 1/8"$

Greatest height. $12-9/32" \pm 1/8"$

Diagonal $16-5/8" \pm 1/8"$

Neck length. $6-1/2" \pm 3/16"$

Screen Dimensions (Minimum):

Greatest width $14-5/16"$

Greatest height. $11-1/8"$

Diagonal $15-9/16"$

Projected area 149 sq. in.

Weight (Approx.) 15 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No. J1-21)

Bulb J-133

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

Basing Designation for BOTTOM VIEW. 12L

Pin 1 - Heater

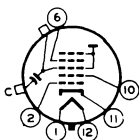
Pin 2 - Grid No.1

Pin 6 - Grid No.4

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor
(Grid No.3,
Grid No.5,
Collector)

C - External
Conductive
Coating

17AVP4



17AVP4/17ATP4

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period. . . .	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from		
Raster Cutoff (Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.4 Current	-25 to +25	μ amp
Grid-No.2 Current	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c5k}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c5k}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet.	0 to 8	gausses

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

*, **, §: See next page.



17AVP4/17ATP4

KINESCOPE

17AVP4

Examples of Use of Design Ranges:

With ultor voltage of	14000	16000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp . . .	-55 to +310	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	31	33	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
---------------------------------------	----------	---------

CATHODE-DRIVE[■] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE.	16000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	640 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive peak value	200 max.	volts
Positive bias value	140 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

■ cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

#, **, §: See next page.

17AVP4



17AVP4/17ATP4

KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between
12000* and 16000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between
220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp 0% to 2.6% of E_{c5g1} volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 8.5% to 19.4% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 8.5% to 19.4% of E_{c2g1} volts

Grid-No.4 Current

-25 to +25

 μ amp

Grid-No.2 Current

-15 to +15

 μ amp

Ion-Trap Magnet Current

(Average)**

$$\sqrt{\frac{E_{c5g1}}{16000}} \times 30$$

ma

Minimum Field Strength of

PM Ion-Trap Magnet§

$$\sqrt{\frac{E_{c5g1}}{16000}} \times 33$$

gausses

Field Strength of Adjustable

Centering Magnet.

0 to 8

gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1

voltage of

14000

16000

volts

and grid-No.2-to-grid-No.1

voltage of

300

300

volts

Grid-No.4-to Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp 0 to 365 0 to 415 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 25 to 58 25 to 58 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 25 to 58 25 to 58 volts

Minimum Field Strength of

PM Ion-Trap Magnet.

31

33

gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

*, **, §: See next page.



17AVP4/17ATP4

KINESCOPE

17AVP4

Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 12000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

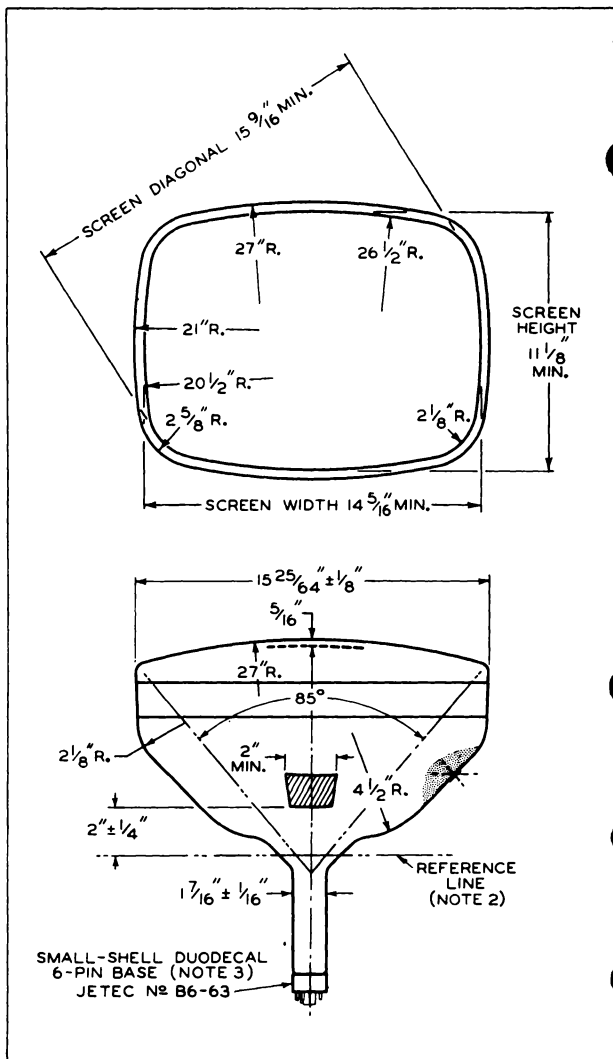
§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

17AVP4



17AVP4/17ATP4 KINESCOPE

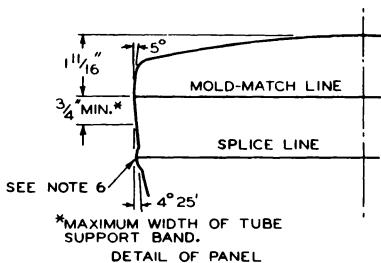


17AVP4



17AVP4/17ATP4

KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUND.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

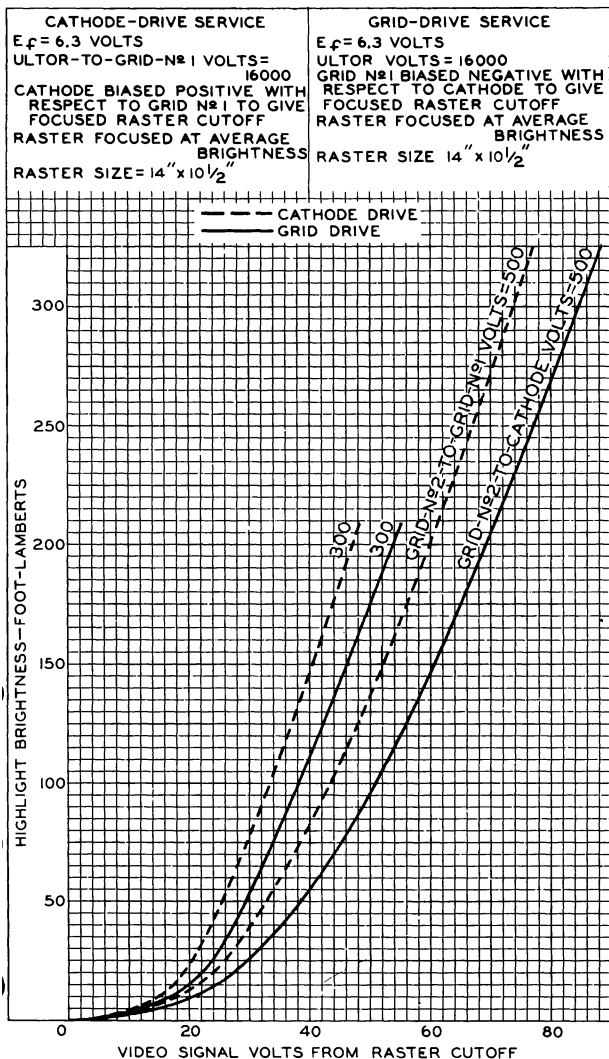
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



17AVP4 / 17ATP4

AVERAGE DRIVE CHARACTERISTICS

17AVP4



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

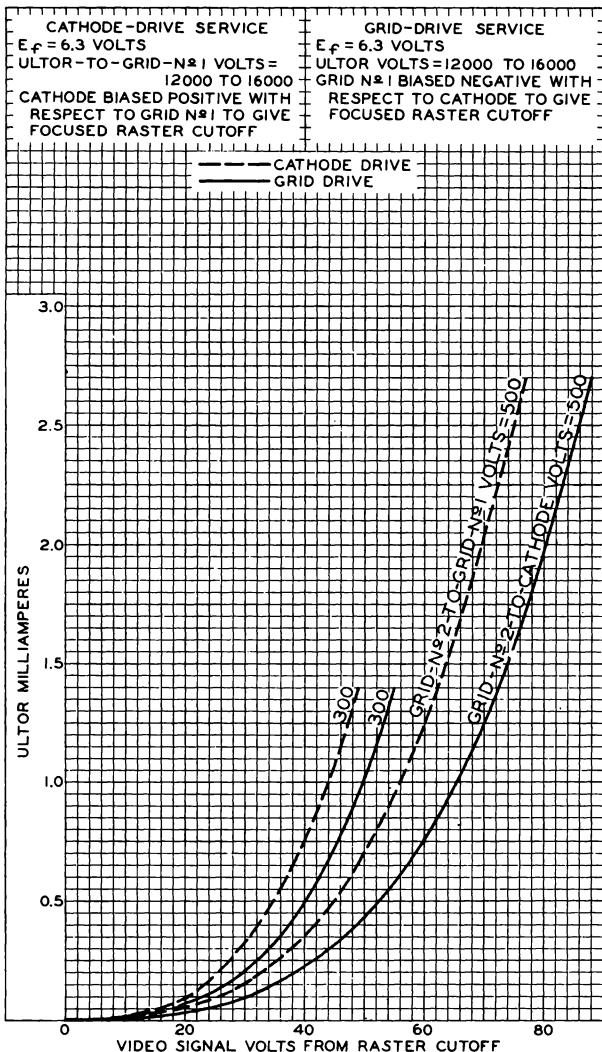
92CM-8746R1

17AVP4



17AVP4/17ATP4

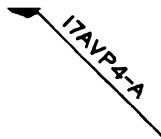
AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8618RI



17AVP4-A/17ATP4-A KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 17AVP4-A/17ATP4-A is the same as the 17AVP4/17ATP4 except that it has an *aluminized phosphor* and greater light output as shown by the curves on the back of this sheet.

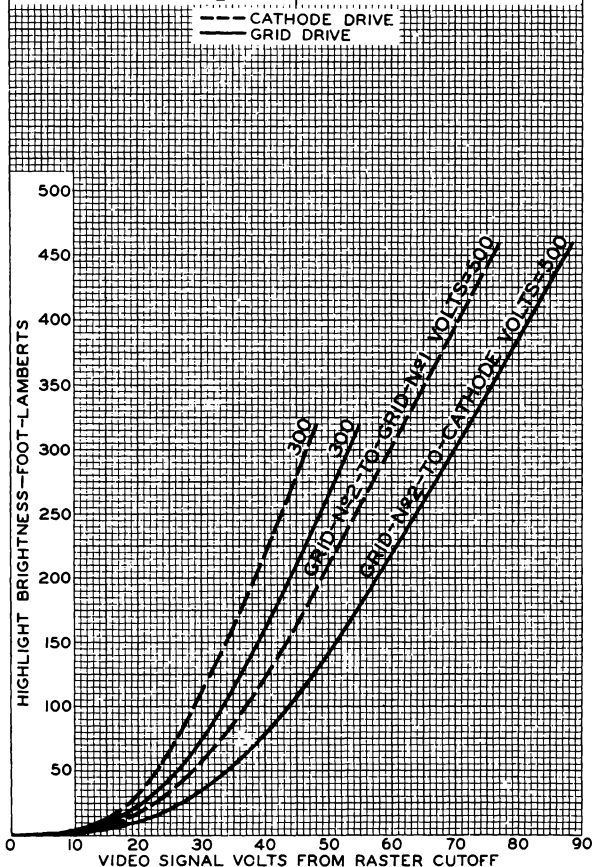
17AVP4-A



17AVP4-A/17ATP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N $\#$ 1 VOLTS=16000	ULTOR VOLTS=16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID-N $\#$ 1 TO GIVE FOCUSED RASTER CUTOFF	GRID-N $\#$ 1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE=14" x 10 1/2"	RASTER SIZE=14" x 10 1/2"



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-892IRI



17BP4-A

17BP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

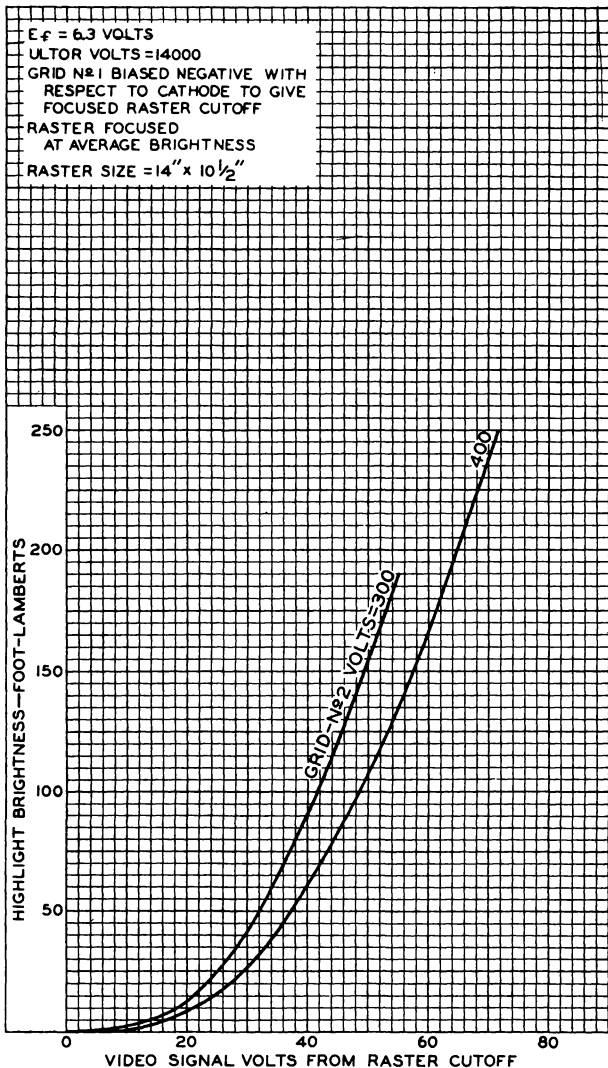
The 17BP4-A is the same as the 17BP4-B except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

17BP4-A



17BP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS





17BP4-B

KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

17BP4-B

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf
Cathode to all other electrodes. 5 μf
External conductive coating to ultor $\begin{cases} 1500 \text{ max.} \\ 750 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 66%

Phosphor (For curves, see front of this Section) . . P4—Sulfide Type

Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $19\text{--}3/16" \pm 3/8"$

Greatest width $15\text{--}25/64" \pm 1/8"$

Greatest height. $12\text{--}9/32" \pm 1/8"$

Diagonal $16\text{--}5/8" \pm 1/8"$

Neck length. $7\text{--}1/2" \pm 3/16"$

Screen Dimensions (Minimum):

Greatest width $14\text{--}1/4"$

Greatest height. $10\text{--}3/4"$

Diagonal $15\text{--}1/4"$

Projected area 140 sq. in.

Weight (Approx.) 18 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J-133

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

Basing Designation for BOTTOM VIEW 12N

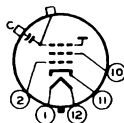
Pin 1—Heater

Pin 2—Grid No.1

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,
Collector)

C—External
Conductive
Coating



17BP4-B

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	16000 max.	volts
GRID-No.2 VOLTAGE.	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3}) between 12000* and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 410 volts

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.2 Current.	-15 to +15	μamp
Focusing-Coil Current (DC)°.	$\left[\sqrt{\frac{E_{c3}}{16000}} \times 106 \right] \pm 10\%$	ma
Ion-Trap Magnet Current		
(Average)**		
	$\sqrt{\frac{E_{c3}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§.		
	$\sqrt{\frac{E_{c3}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet		
	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of		12000	14000	volts
and grid-No.2 voltage of		300	300	volts
Grid-No.1 Voltage for				
Visual Extinction of				
Focused Raster				
	-28 to -72	-28 to -72		volts
Grid-No.1 Video Drive				
from Raster Cutoff				
(Black Level):				
White-level value				
(Peak positive)	28 to 72	28 to 72		volts
Focusing-Coil Current (DC)	92 ± 10%	99 ± 10%		ma
Minimum Field Strength of				
PM Ion-Trap Magnet				
	29	31		gausses

*, °, **, §: See next page.



17BP4-B KINESCOPE

17BP4-B

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

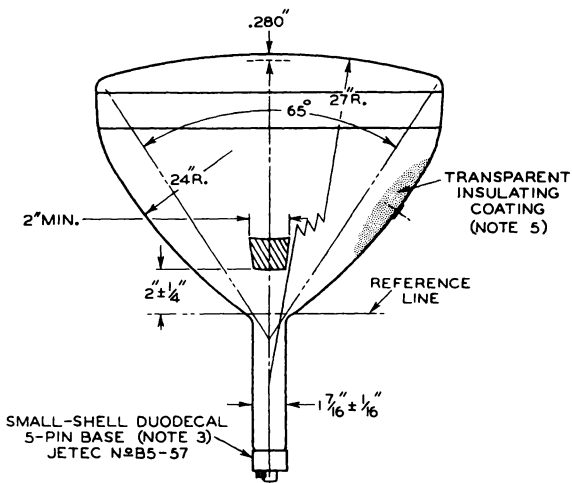
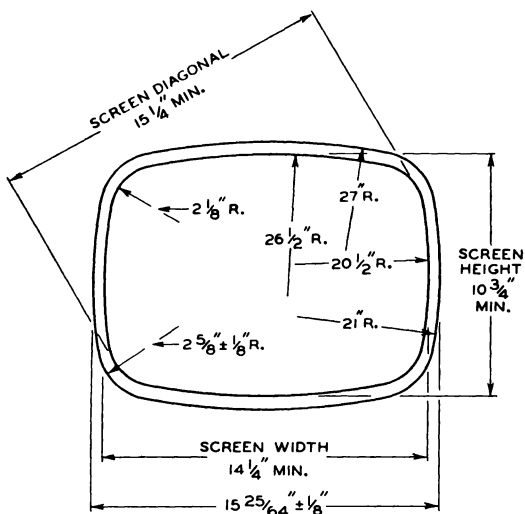
- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.
- For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (*See Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern Set for a 14-1/4" x 10-3/4" picture size.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussess. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

17BP4-B



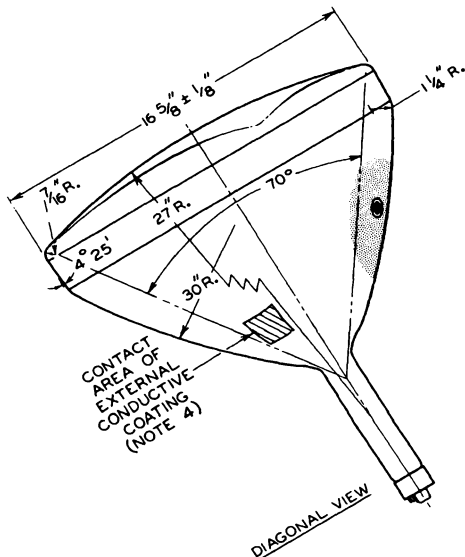
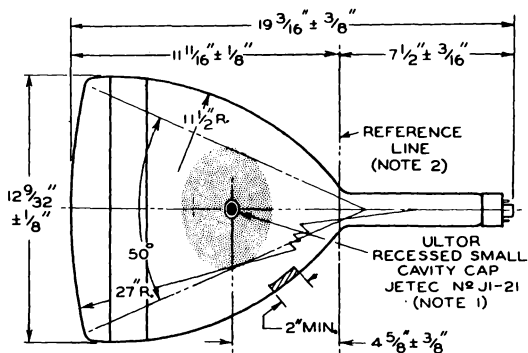
17BP4-B KINESCOPE





17BP4-B KINESCOPE

17BP4-B



92CL-8879

17BP4-B



17BP4-B KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

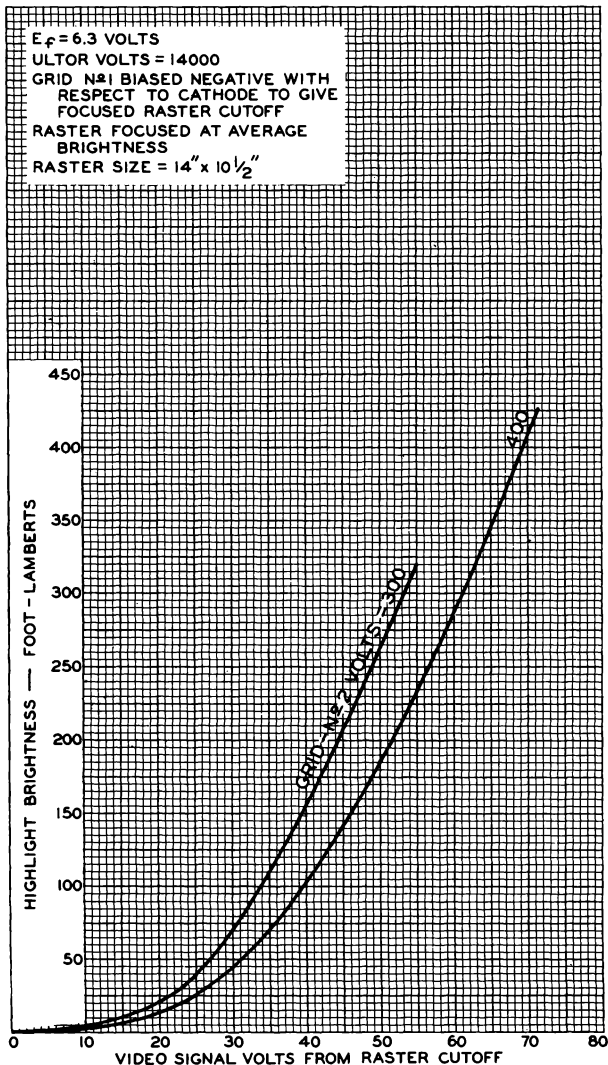
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.



17BP4-B

17BP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS

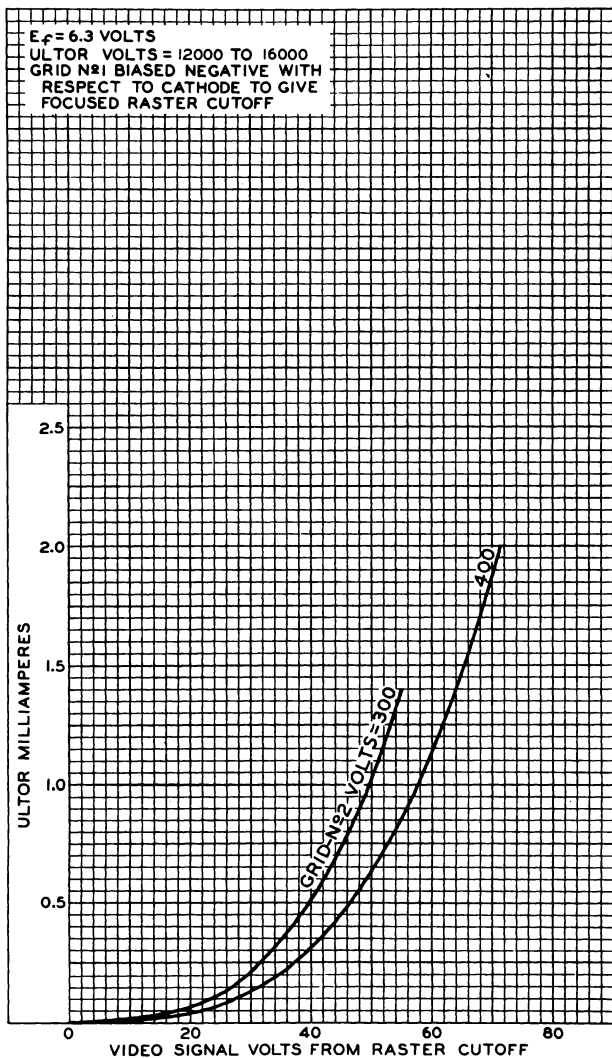


17BP4-B



17BP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS





17CP4

KINESCOPE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

17CP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 6 μf

Cathode to All Other Electrodes. 5 μf

Face Plate (Transmission of about 65%) . . . Frosted Filterglass

Phosphor (For Curves, see front of this Section) No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Maximum Overall Length 19"

Greatest Diagonal of Tube at Lip 16-13/16" $\pm$ 3/16"

Greatest Width of Tube at Lip. 15-15/16" $\pm$ 1/8"

Greatest Height of Tube at Lip 12-1/4" $\pm$ 1/8"

Screen Size. 14-5/8" x 11"

Mounting Position. Any

Anode Terminal Metal-Shell Lip

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

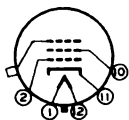
Basing Designation for BOTTOM VIEW 12D1

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2

Pin 11-Cathode



Pin 12-Heater

Metal-Shell Lip:

Anode

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE⁰ 16000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode. 180 max. volts

⁰ The product of anode voltage and average anode current should be limited to 6 watts.

JAN. 1, 1951

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17CP4



17CP4

KINESCOPE

Typical Operation:

Anode Voltage*	12000	14000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing Coil Current (DC)†	96 ± 6%	104 ± 6%	ma
Field Strength of Single-Field Ion-Trap Magnet§	45	50	gausses
Ion-Trap Magnet Current (DC, approx.)#	70	-	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 ma. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-Circuit Resistance	18000 min.	ohms

The resistors used should be capable of withstanding the applied voltage.

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 12000 volts.

† For specimen focusing coil similar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 14-3/8" x 10-11/16" picture area sharply focused at center of screen.

§ Measured at center of field with General Electric Gauss Meter, Cat. No. 409X51.

For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.111, located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

When operated at anode voltages up to 16 kilovolts, the 17CP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at anode voltages as high as 17.5 kilovolts (absolute value), shielding of the 17CP4 for x-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

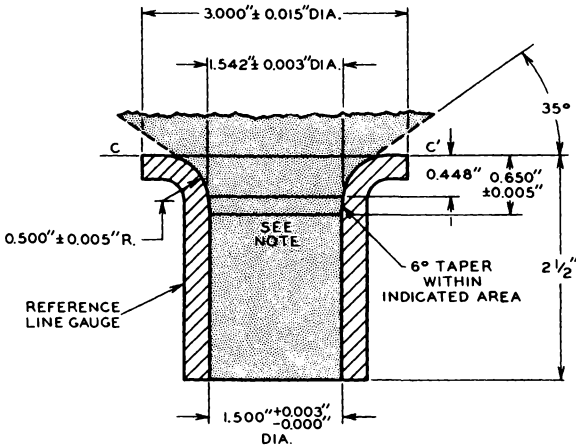


17CP4

KINESCOPE

REFERENCE-LINE GAUGE

*Reference-Line Gauge (JETEC No. 110) with Supplementary
Information on Recommended Inside Contour of
Yoke to Provide Proper Location of
Yoke on Neck-Funnel Section*



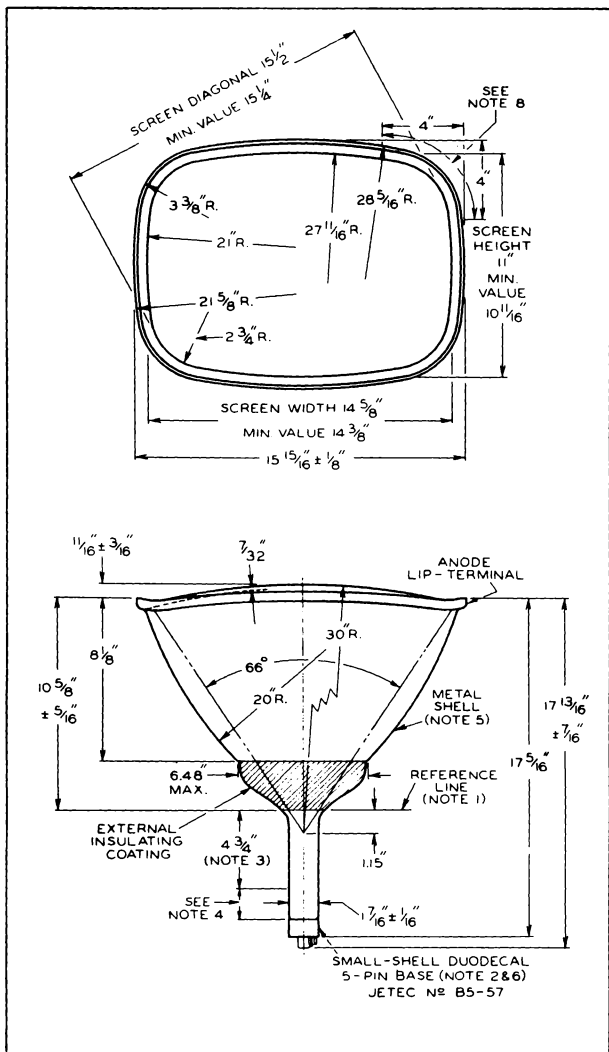
NOTE: INNER SURFACE OF YOKE MUST
NOT EXTEND INTO SHADED REGION

92CS-7391



17CP4

KINESCOPE



JAN. 1, 1951

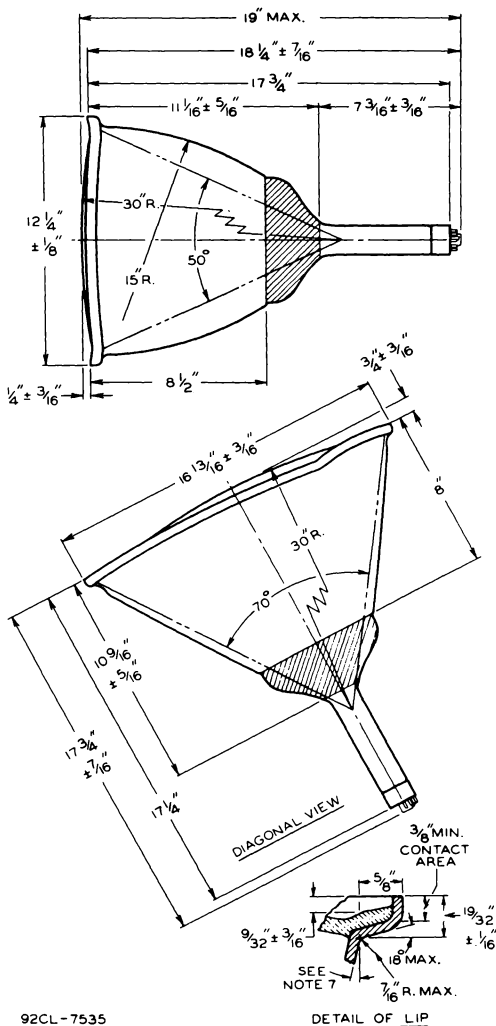
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7535A



17CP4

17CP4 KINESCOPE



92CL-7535

DETAIL OF LIP

JAN. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7535B

17CP4



17CP4

KINESCOPE

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE (JETEC No. 110) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL SHELL AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 3: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.

NOTE 4: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET. DIRECTION OF THE FIELD OF THE ION-TRAP MAGNET SHOULD BE SUCH THAT THE NORTH POLE IS ADJACENT TO VACANT PIN POSITION No. 8 AND THE SOUTH POLE TO PIN No. 2.

NOTE 5: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST HAVE INSULATING PROPERTIES ADEQUATE TO WITHSTAND THE APPLIED ANODE VOLTAGE PLUS 10%.

NOTE 6: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 6 MAY VARY FROM THE MAJOR AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°.

NOTE 7: IN THIS REGION THE ANGULAR VARIATION AROUND PERIPHERY OF SHELL IS 0° TO 180°.

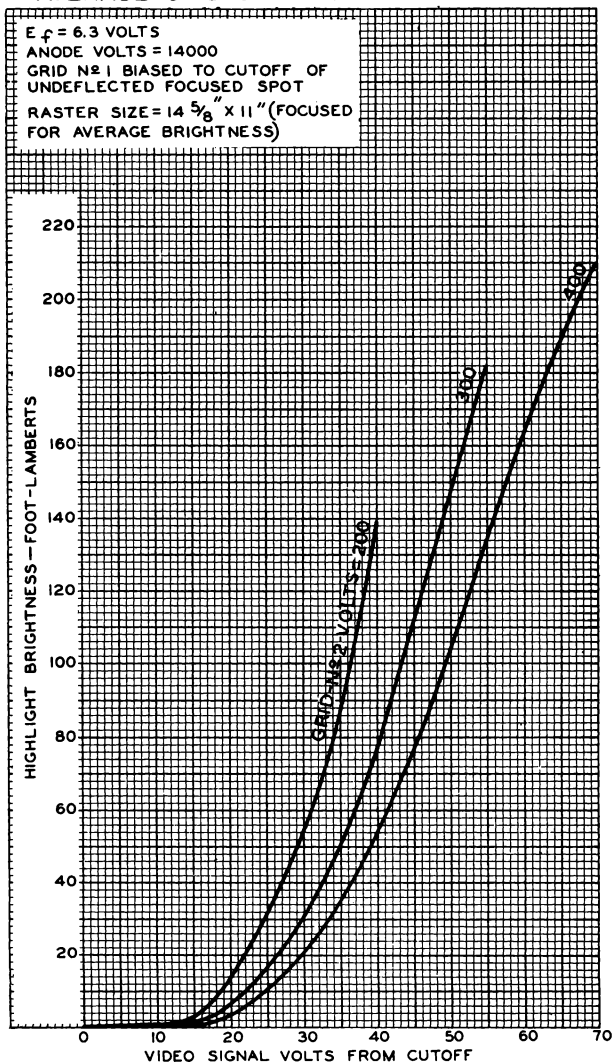
NOTE 8: SUPPORT TUBE BY LIP ONLY AT CORNERS WITHIN THIS SPACE.



17CP4

17CP4

AVERAGE GRID-DRIVE CHARACTERISTICS



SEPT. 1, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

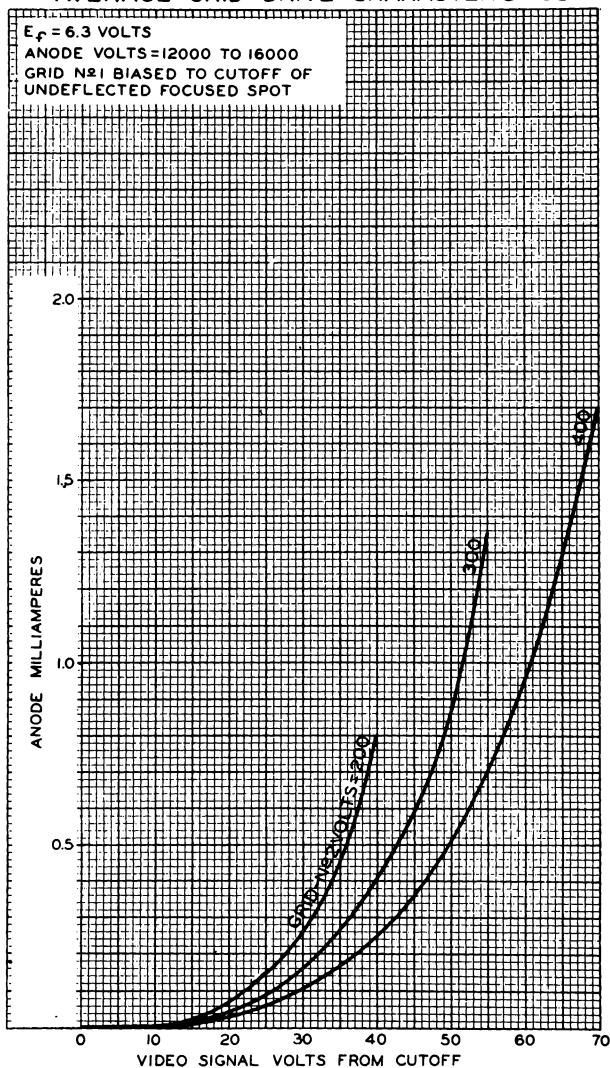
92CM-7533

17CP4



17CP4

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 3, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7548



17GP4

KINESCOPE

RECTANGULAR METAL-SHELL TYPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes	6	μ f
---	---	---------

Cathode to All Other Electrodes	5	μ f
---	---	---------

Face Plate (With about 66% light transmission) Frosted Filterglass

Phosphor No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal	70°
--------------------	-----

Horizontal	66°
----------------------	-----

Vertical	50°
--------------------	-----

Ion-Trap Gun Requires External, Single-Field Magnet

Maximum Overall Length	19-5/16"
----------------------------------	----------

Greatest Diagonal of Tube at Lip	16-13/16" $\pm$ 3/16"
--	-----------------------

Greatest Width of Tube at Lip	15-15/16" $\pm$ 1/8"
---	----------------------

Greatest Height of Tube at Lip	12-1/4" $\pm$ 1/8"
--	--------------------

Screen Size	14-5/8" x 11"
-----------------------	---------------

Mounting Position	Any
-----------------------------	-----

Ultor® Terminal	Metal-Shell Lip
---------------------------	-----------------

Base	Small-Shell Duodecal 6-Pin (JETEC No. B6-63)
----------------	--

BOTTOM VIEW

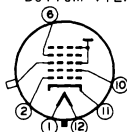
Pin 1-Heater

Pin 2-Grid No.1

Pin 6-Grid No.4

Pin 10-Grid No.2

Pin 11-Cathode



Pin 12-Heater

Metal-Shell Lip -

Grid No.3,

Grid No.5,

Collector

Maximum Ratings, Design-Center Values:

ULTOR® VOLTAGE	16000 max.	volts
--------------------------	------------	-------

GRID-No.4 VOLTAGE	5000 max.	volts
-----------------------------	-----------	-------

GRID-No.2 VOLTAGE	500 max.	volts
-----------------------------	----------	-------

GRID-No.1 VOLTAGE:

Negative bias value	125 max.	volts
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Positive bias value	0 max.	volts
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Positive peak value	2 max.	volts
-------------------------------	--------	-------

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds	410 max.	volts
------------------------------------	----------	-------

After equipment warm-up period	180 max.	volts
--	----------	-------

Heater positive with respect to cathode	180 max.	volts
---	----------	-------

●: See next page.

MAY 1, 1951

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17GP4

17GP4



17GP4

KINESCOPE

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000* and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 500 volts

Grid-No.4 Voltage for Ultor

Current of 100 μ amp. 19.1% to 25.9% of E_u volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot 11% to 25.7% of E_{c2} volts

Grid-No.4 Current.

-15 to +25 μ amp

Grid-No.2 Current.

-15 to +15 μ amp

Field Strength of Single-Field

Ion-Trap Magnet (Approx.). . . $\sqrt{\frac{E_u}{12000}} \times 35$ gauss

Field Strength of Adjustable

Centering Magnet 0 to 8 gauss

Examples of Use of Design Ranges:

For ultor voltage of. . .	12000	14000	volts
and grid-No.2 voltage of.	300	300	volts

Grid-No.4 Voltage for

Ultor Current of

100 μ amp 2290 to 3100 2670 to 3620 volts

Grid-No.1 Voltage† -33 to -77 -33 to -77 volts

Ion-Trap Magnet

(Rated Strength) 35 40 gauss

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

- In the 17GP4, grid No.5 which has the ultor function, grid No.3, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

- † For visual extinction of undeflected focused spot.



17GP4

17GP4

KINESCOPE

OPERATING NOTES

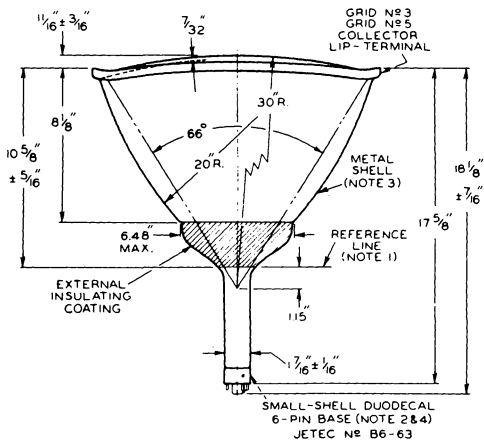
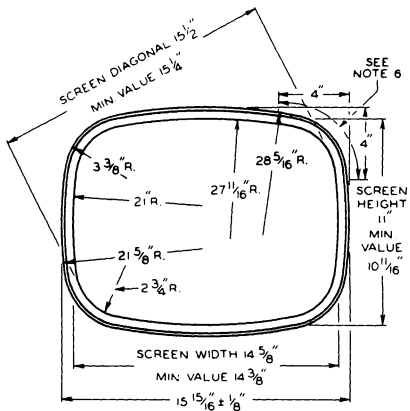
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 17GP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 17.6 kilovolts (absolute value), shielding of the 17GP4 for x-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Direction of the field of the ion-trap magnet should be such that the north pole is adjacent to vacant pin position No. 8 and the south pole to pin No. 2.

17GP4



17GP4 KINESCOPE



MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

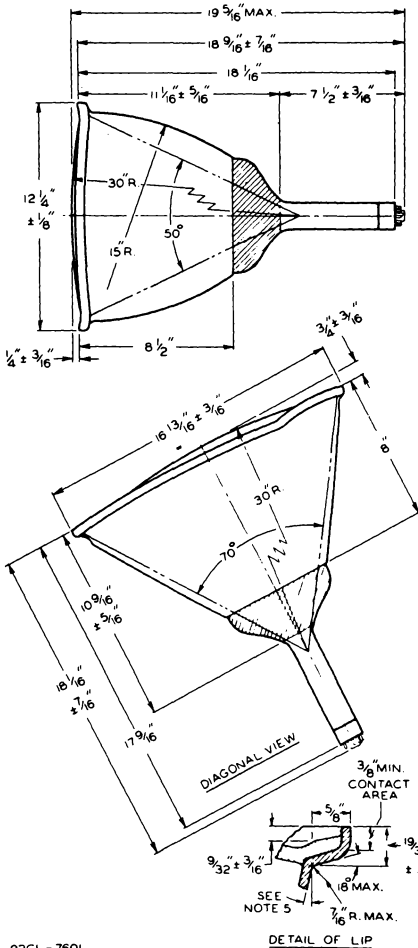
CE-7601A



17GP4

KINESCOPE

17GP4



92CL - 7601

DETAIL OF LIP

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7601B

17GP4



17GP4

KINESCOPE

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.

NOTE 5: IN THIS REGION THE ANGULAR VARIATION AROUND PERIPHERY OF METAL SHELL IS 0° TO 18° .

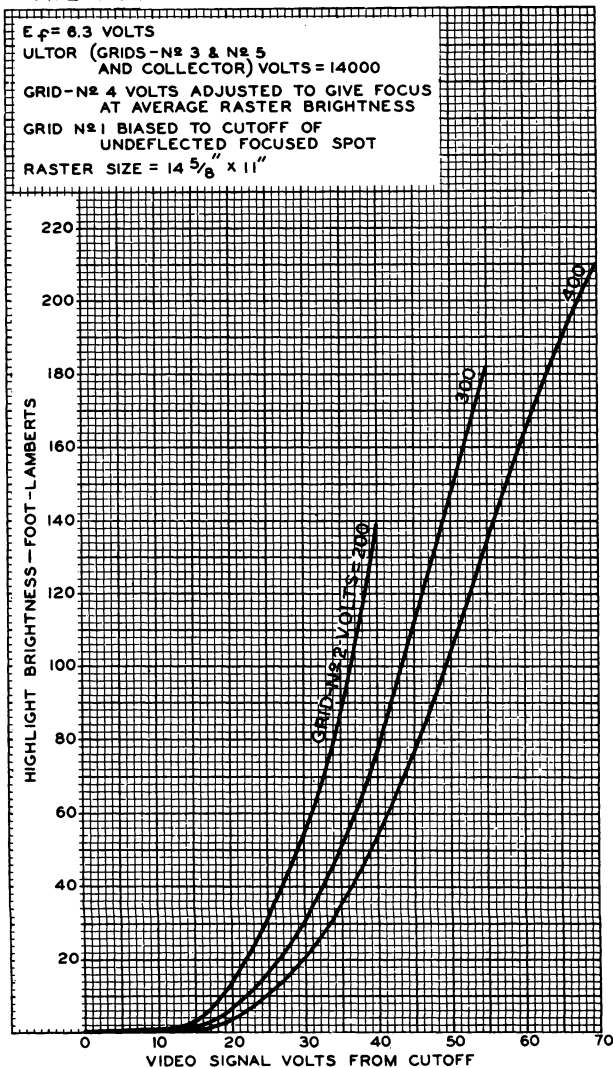
NOTE 6: SUPPORT TUBE BY LIP ONLY AT CORNERS WITHIN THIS SPACE.



17GP4

17GP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 8, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

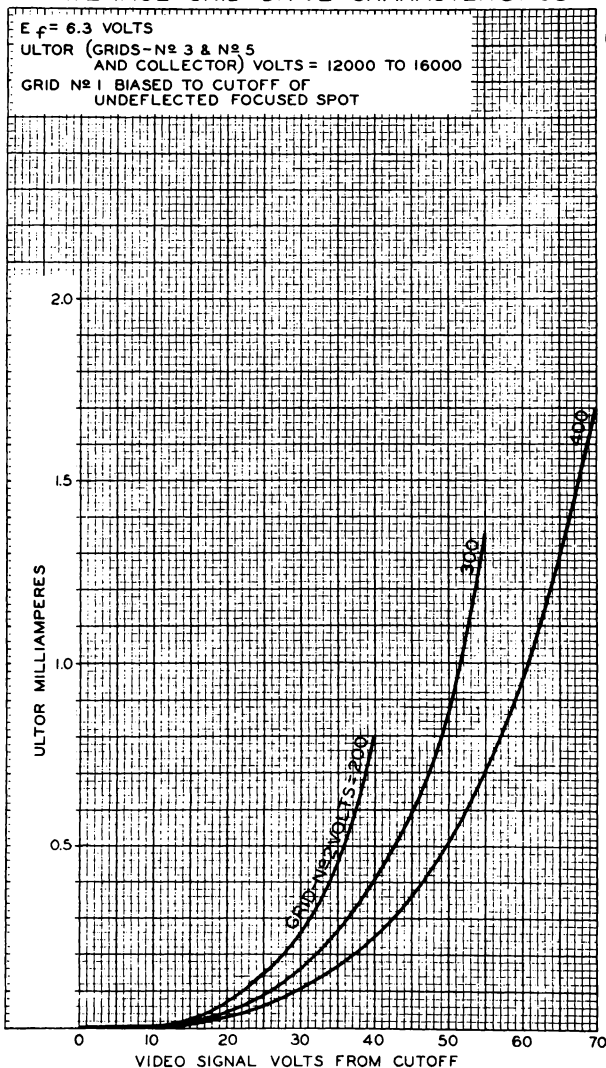
92CM-7606

17GP4



17GP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 8, 1951

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7607



17HP4 / 17RP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

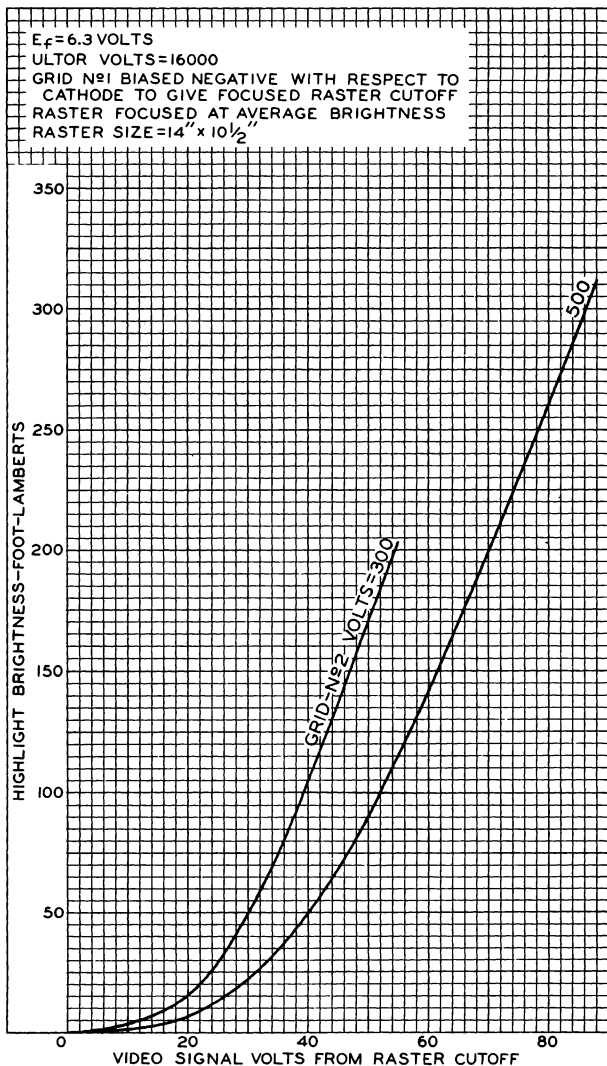
The 17HP4/17RP4 is the same as the 17HP4-B except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

17HP4



17HP4

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8842



17HP4-B

KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

17HP4-B

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf
Cathode to all other electrodes 5 μf
External conductive coating to ultor $\begin{cases} 1500 \text{ max.} \\ 750 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 66%

Phosphor (For curves, see front of this Section). . . P4—Sulfide Type

Aluminized

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°
Horizontal 65°
Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $19\text{--}3/16" \pm 3/8"$
Greatest width $15\text{--}25/64" \pm 1/8"$
Greatest height $12\text{--}9/32" \pm 1/8"$
Diagonal $16\text{--}5/8" \pm 1/8"$
Neck length $7\text{--}1/2" \pm 3/16"$

Screen Dimensions (Minimum):

Greatest width $14\text{--}1/4"$
Greatest height $10\text{--}3/4"$
Diagonal $15\text{--}1/4"$
Projected area 140 sq. in.

Weight (Approx.) 18 lbs

Mounting Position Any

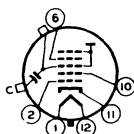
Cap Recessed Small Cavity (JETEC No. J1-21)

Bulb J-133

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor
(Grid No.3,
Grid No.5,
Collector)
C - External
Conductive
Coating



17HP4-B

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 12000# and 16000 volts and grid-No.2 voltage (E_{c2k}) between 150 and 500 volts

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.4 Current	-25 to +25	μ amp
Grid-No.2 Current	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c5k}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c5k}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

#, **, §: See next page.



17HP4-B KINESCOPE

17HP4-B

Examples of Use of Design Ranges:

With ultor voltage of	14000	16000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp . . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value			
(Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	31	33	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
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CATHODE-DRIVE[■] SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE	16000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

*, **, §: See next page.

17HP4-B



17HP4-B KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between
12000# and 16000 volts
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between
165 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μ amp.			0% to 2.6% of $E_{c_5g_1}$	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.			8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)			8.5% to 19.4% of $E_{c_2g_1}$	volts
Grid-No.4 Current.			-25 to +25	μ amp
Grid-No.2 Current.			-15 to +15	μ amp
Ion-Trap Magnet Current (Average)**			$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet §			$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.			0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	14000	16000	volts
and grid-No.2-to-grid-No.1 voltage of	300	300	volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μ amp.			0 to 365	0 to 415	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster			25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)			25 to 58	25 to 58	volts
Minimum Field Strength of PM Ion-Trap Magnet.			31	33	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

#, **, §: See next page.



17HP4-B

KINESCOPE

17HP4-B

Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 12000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

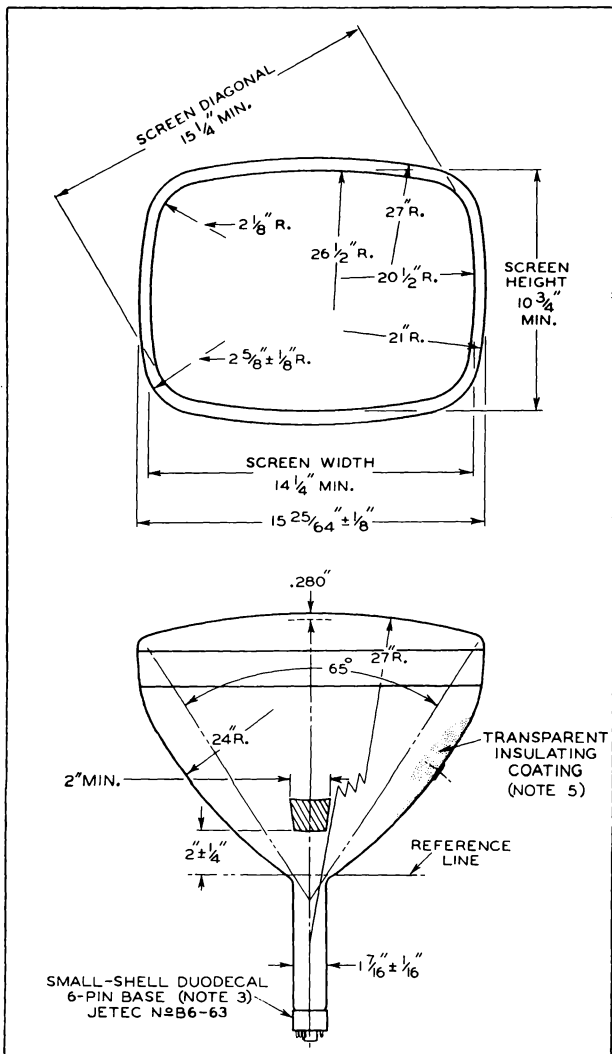
§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

17HP4-B



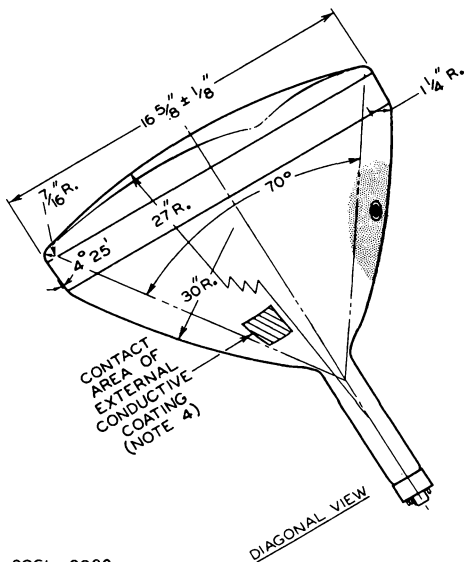
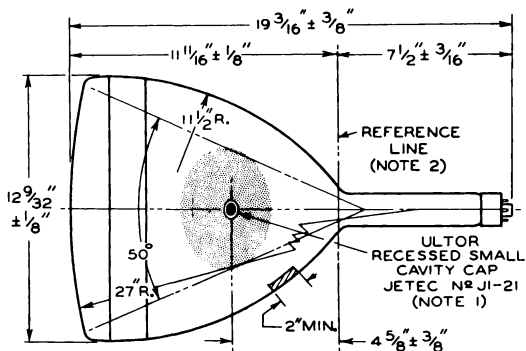
17HP4-B KINESCOPE





17HP4-B KINESCOPE

17HP4-B



92CL-8880

17HP4-B



17HP4-B KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

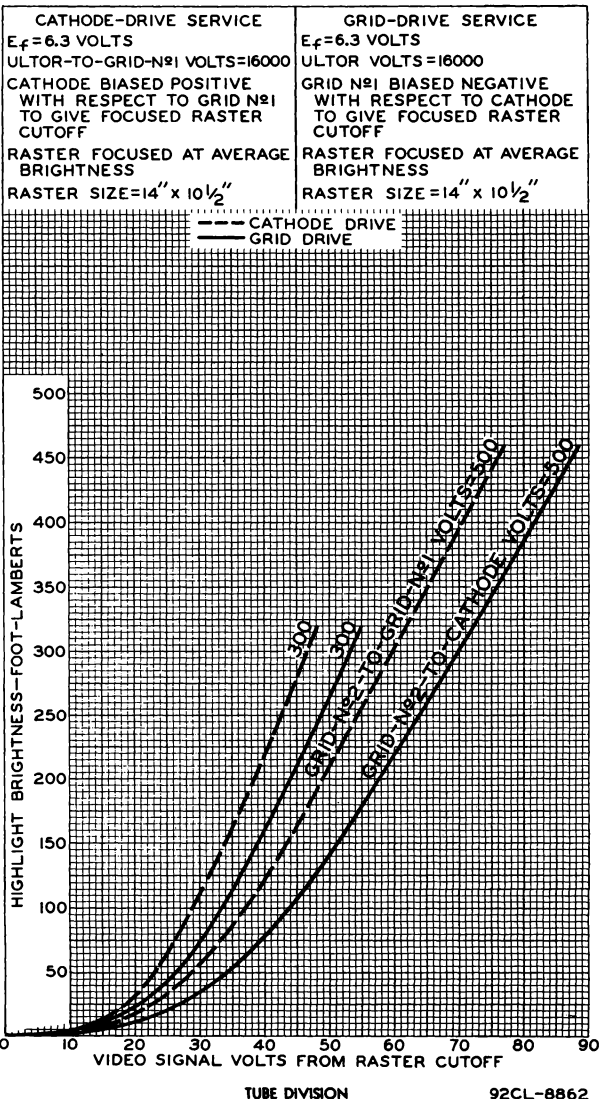
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.



17HP4-B

17HP4-B

AVERAGE DRIVE CHARACTERISTICS

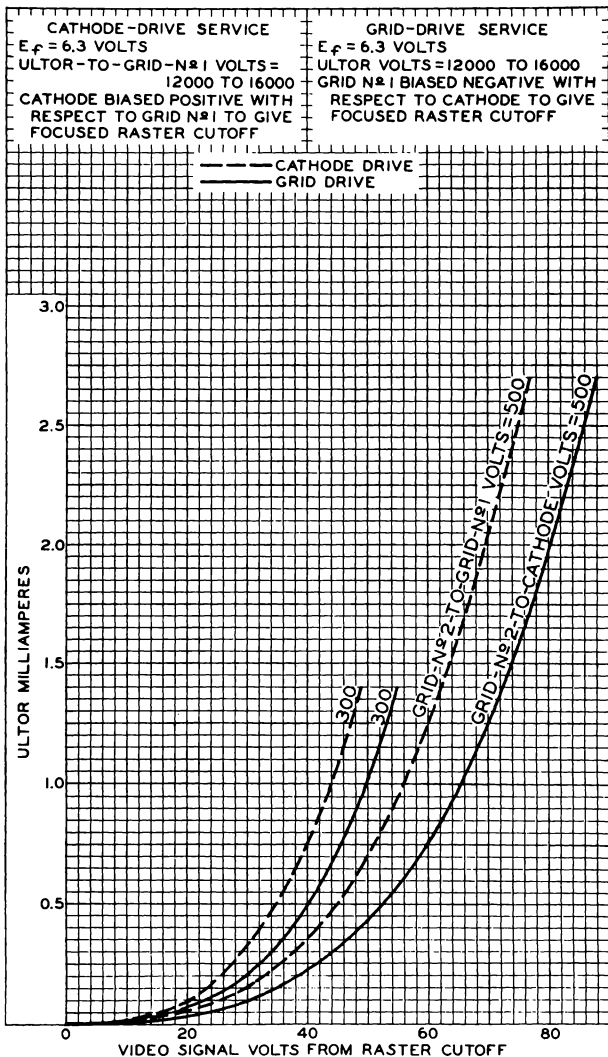


17HP4-B



17HP4-B

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8915



17JP4 KINESCOPE RECTANGULAR GLASS TYPE

17JP4

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes 6 μf
Cathode to All Other Electrodes 5 μf
External Conductive Coating to Ultor* { 750 max. μf
500 min. μf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 66%

Phosphor (For Curves, see front of this Section). P4—Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Tube Dimensions:

Overall Length 19-3/16" $\pm$ 3/8"

Greatest Diagonal 16-5/8" $\pm$ 1/8"

Greatest Width 15-3/8" $\pm$ 1/8"

Greatest Height 12-9/32" $\pm$ 1/8" -7/32"

Minimum Screen Dimensions:

Greatest Width 14-1/4"

Greatest Height 10-3/4"

Diagonal 15-1/4"

Weight (Approx.) 18 lbs

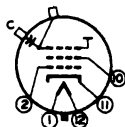
Mounting Position Any

Cap Recessed Small Cavity (JETEC No. J1-21)

Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

BOTTOM VIEW

Pin 1—Heater
Pin 2—Grid No.1
Pin 10—Grid No.2
Pin 11—Cathode
Pin 12—Heater



Cap—Ultor
(Grid No.3,
Collector)
C—External
Conductive
Coating

Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE 18000 max. volts

- * In the 17JP4, grid No.3 which has the ultor function and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

17JP4



17JP4

KINESCOPE

GRID-No.2 VOLTAGE	410 max. volts
GRID-No.1 VOLTAGE:	
Negative bias value	125 max. volts
Positive bias value	0 max. volts
Positive peak value	2 max. volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode:	
During equipment warm-up period	
not exceeding 15 seconds	410 max. volts
After equipment warm-up period.	150 max. volts
Heater positive with respect to cathode .	150 max. volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000# and 18000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 410 volts.

Grid-No.1 Voltage for Visual Extinction of Undelected	
Focused Spot	11% to 25.7% of E_{c2} volts
Grid-No.2 Current	-15 to +15 μ amp
Focusing-Coil Current (DC) ^{oo} .	$\left[\sqrt{\frac{E_u}{12000}} \times 96 \right] \pm 10\%$ ma
Field Strength of Single-Field Ion-Trap Magnet (Approx.)** .	$\sqrt{\frac{E_u}{12000}} \times 42$ gauss
Field Strength of Adjustable Centering Magnet	0 to 8 gauss

Examples of Use of Design Ranges:

For ultor voltage of	14000	16000	volts.
and grid-No.2 voltage of	300	300	volts.
Grid-No.1 Voltage for Visual Extinction of Undelected			
Focused Spot.	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC). .	104 $\pm$ 10%	110 $\pm$ 10%	ma
Ion-Trap Magnet			
(Rated Strength).	45	50	gauss

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max. megohms
--	------------------

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

^{oo} For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 14-1/4" x 10-3/4" picture area sharply focused at center of screen.

** With a specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No. 111 located in optimum position and rotated to give maximum brightness, the ion-trap magnet current is 82 milliamperes dc when the ultor voltage is 14000 volts and grid-No.2 voltage is 300 volts.

For x-ray shielding considerations, see sheet X-RAY
PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

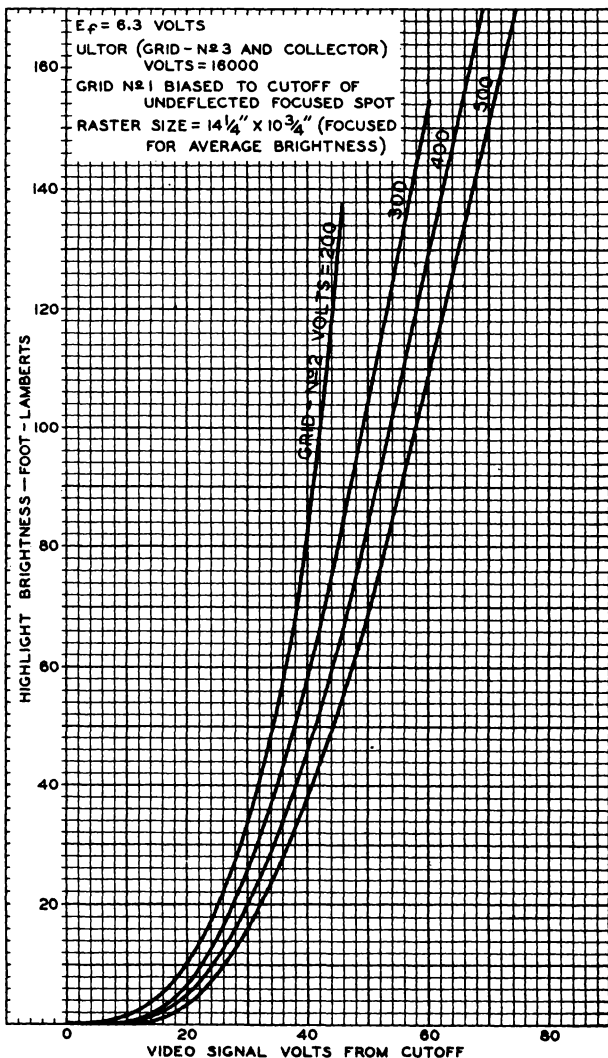
TENTATIVE DATA



17JP4

17JP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 13, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

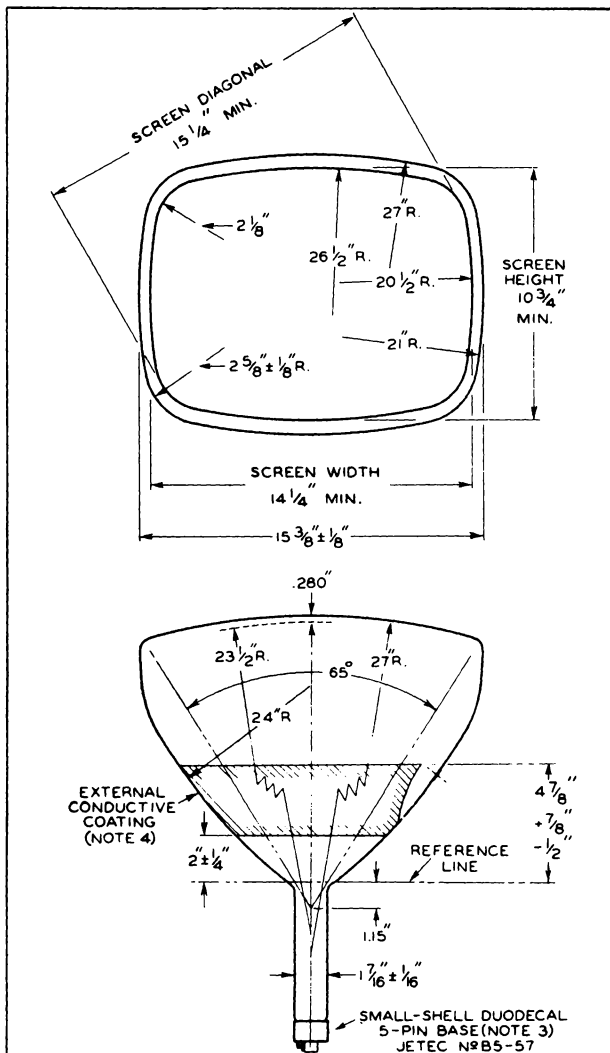
92CM - 7753

17JP4



17JP4

KINESCOPE



JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

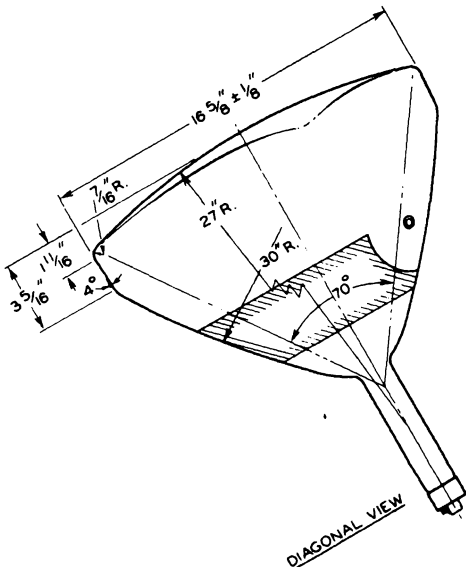
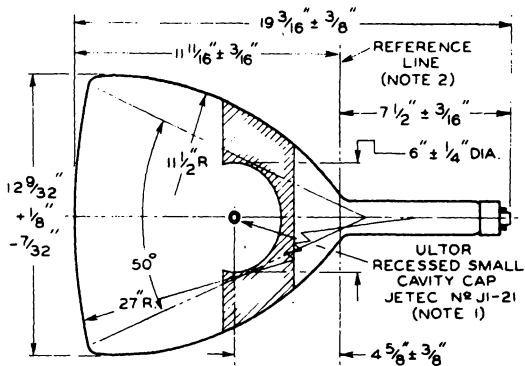
CE-7745R2A



17JP4

KINESCOPE

17JP4



92CL-7745R2

JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7745R2B

17JP4



17JP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7745R2C



17JP4

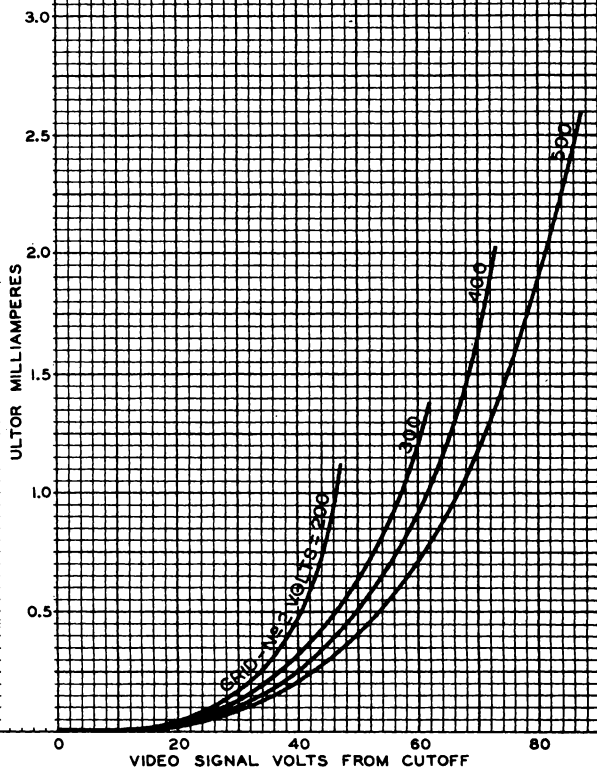
17JP4

AVERAGE GRID-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS

ULTOR (GRID-N^o3 AND COLLECTOR)
VOLTS = 14000 TO 18000

GRID N^o1 BIASED TO CUTOFF OF
UNDEFLECTED FOCUSED SPOT



NOV. 14, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7652R1



17LP4 / 17VP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

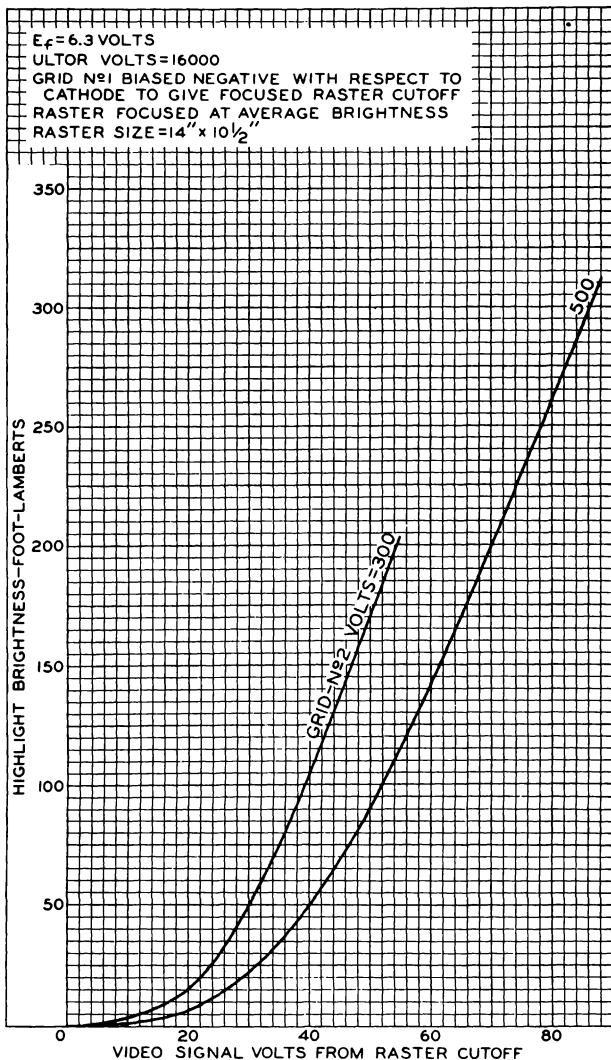
The 17LP4/17VP4 is the same as the 17LP4-A except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

17LP4



17LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8916



17LP4-A

KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

17LP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. 0.6 $\pm$ 10% amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μ f
Cathode to all other electrodes. 5 μ f
External conductive coating to ultor { 1500 max. μ f
750 min. μ f

Faceplate, Cylindrical Filterglass

Light transmission (Approx.) 72%

Phosphor (For curves, see front of this section). . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length 19-3/16" $\pm$ 3/8"

Greatest width 15-25/64" $\pm$ 1/8"

Greatest height. 12-9/32" $\pm$ 1/8"

Diagonal 16-5/8" $\pm$ 1/8"

Neck length. 7-1/2" $\pm$ 3/16"

Screen Dimensions (Minimum):

Greatest width 14-1/4"

Greatest height. 10-3/4"

Diagonal 15-5/16"

Projected area 140 sq. in.

Weight (Approx.) 19 lbs

Mounting Position. Any

Cap: Recessed Small Cavity (JETEC No. J1-21)

Bulb J-133

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1—Heater

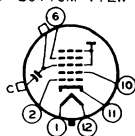
Pin 2—Grid No.1

Pin 6—Grid No.4

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,

Grid No.5,

Collector)

C—External

Conductive

Coating



I7LP4-A

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE:	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

*With any ultor voltage (E_{c5}) between 12000# and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 500 volts*

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp.	-0.4% to +2.2% of E_{c5}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive from		
Raster Cutoff (Black Level):		
White-Level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.4 Current	-25 to +25	μ amp
Grid-No.2 Current	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c5}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c5}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.



17LP4-A

17LP4-A

KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	14000	16000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.4 Voltage for			
Focus with Ultor			
Current of 100 μ amp. . . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for			
Visual Extinction of			
Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive			
from Raster Cutoff			
(Black Level):			
White-level value			
(Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of			
PM Ion-Trap Magnet	31	33	gausses

Maximum Circuit Values:

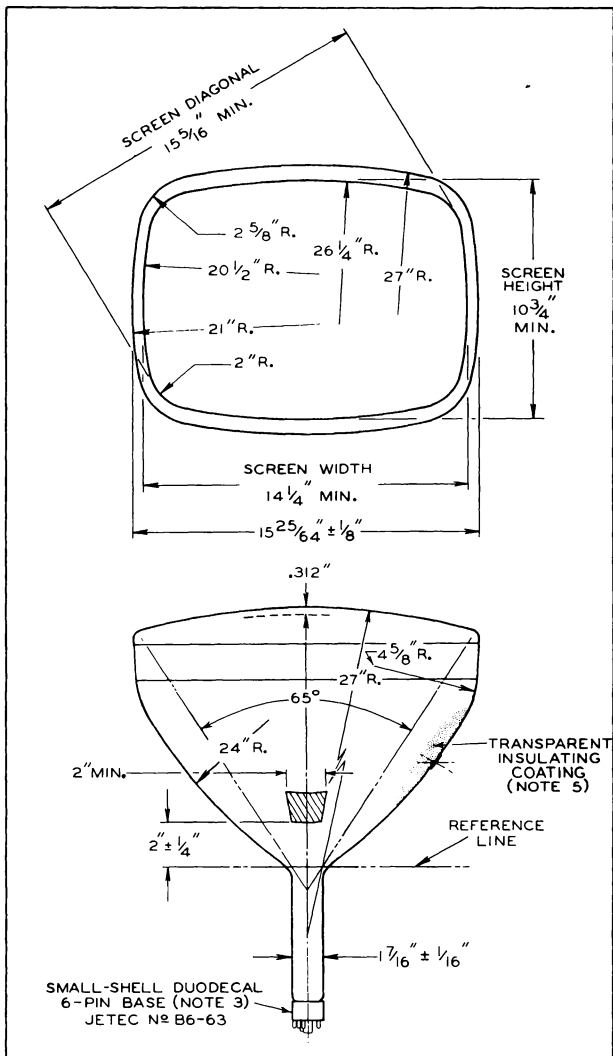
Grid-No.1-Circuit Resistance	1.5 max.	megohms
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*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

17LP4-A



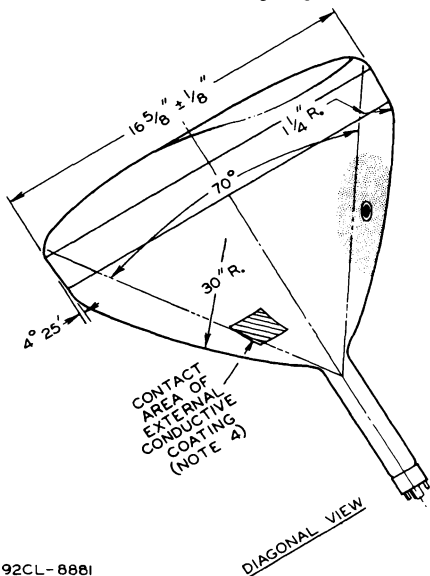
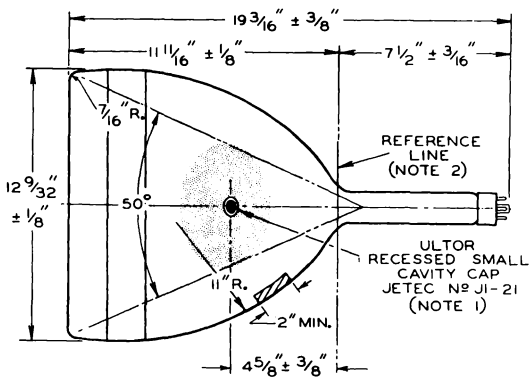
17LP4-A KINESCOPE





17LP4-A KINESCOPE

17LP4-A



92CL-8881

17LP4-A



17LP4-A KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

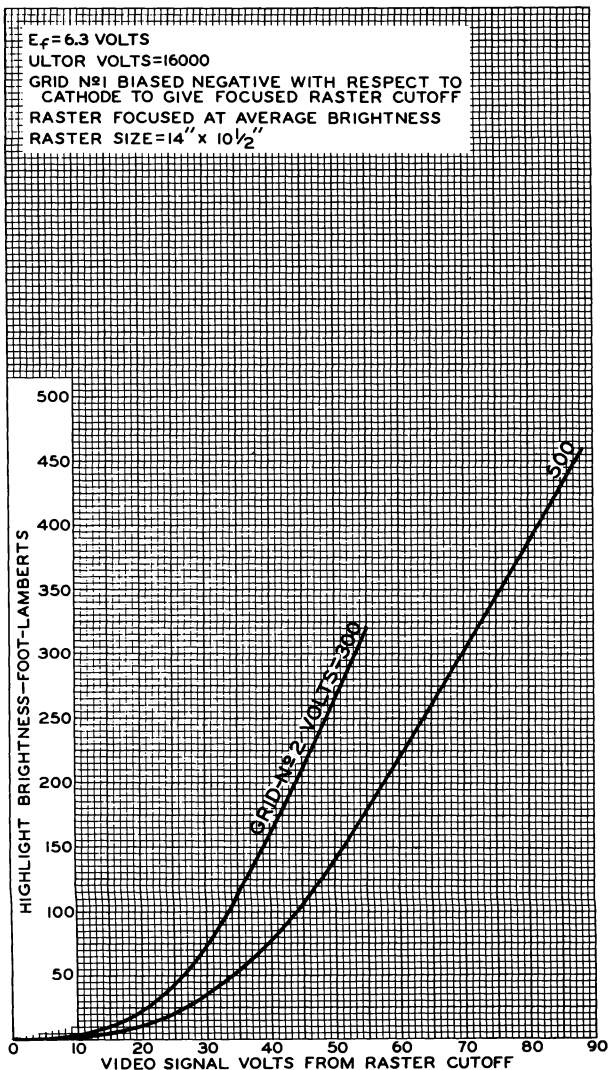
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.



17LP4-A

17LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS

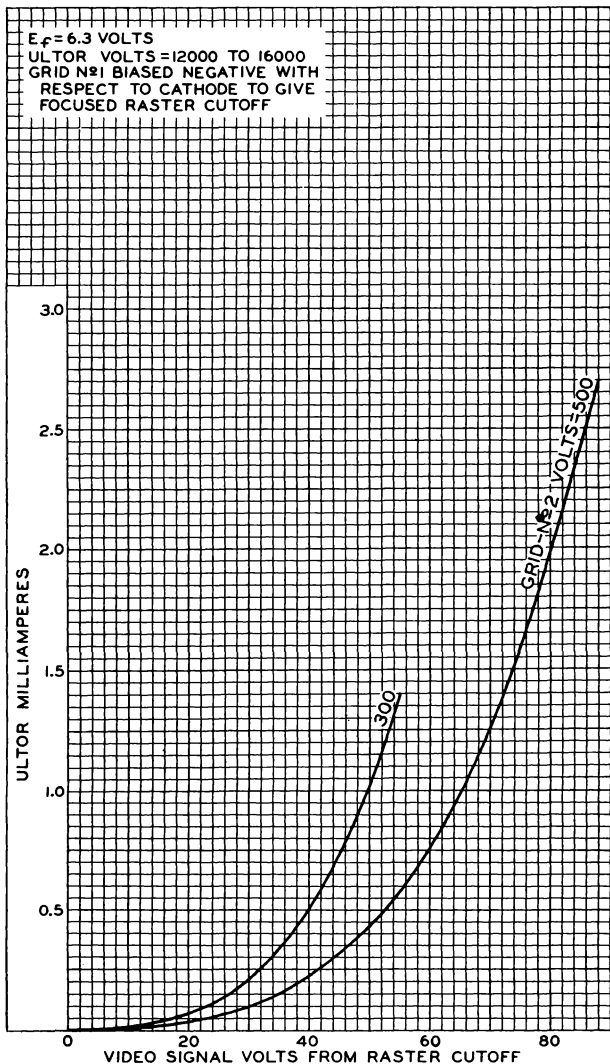


17LP4-A



17LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8870



17QP4

17QP4

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA**General:**

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes 6 μ fCathode to All Other Electrodes 5 μ fExternal Conductive Coating to Ultor* { 1500 max. μ f
750 min. μ f

Faceplate, Cylindrical With Toric

Inner Surface† Filterglass

Light Transmission (Approx.) 66%

Phosphor (For Curves, see front

of this Section). P4—Sulfide Type

Fluorescence and Phosphorescence. White

Persistence of Phosphorescence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Tube Dimensions:

Overall Length 19-3/16" $\pm$ 3/8"Greatest Diagonal 16-5/8" $\pm$ 1/8"Greatest Width 15-3/8" $\pm$ 1/8"Greatest Height 12-1/4" $\pm$ 1/8"

Minimum Screen Dimensions:

Greatest Width 14-1/4"

Greatest Height 10-3/4"

Diagonal 15-5/16"

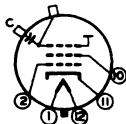
Weight (Approx.) 19 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No. J1-21)

Base. Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

- Pin 1—Heater
Pin 2—Grid No.1
Pin 10—Grid No.2
Pin 11—Cathode
Pin 12—Heater



- Cap—Ultor (Grid No.3,
Collector)
C—External
Conductive
Coating

† The toric surface in the 17QP4 is described by a segment of a circle having a radius of about 60" rotated about a straight line which is (1) parallel to the axis of the outer cylindrical surface, (2) positioned in a plane passing through the axis of the cylindrical surface and the center element thereof, and (3) spaced approximately 25" from the cylindrical surface.

•: See next page.

JULY 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17QP4



17QP4

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE	16000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000* and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 410 volts

Grid-No.1 Voltage for Visual Extinction of Undelected		
Focused Spot	11% to 25.7% of E_{c2}	volts
Grid-No.2 Current.	-15 to +15	μ amp
Focusing-Coil Current (DC) ⁰⁰	$\left[\sqrt{\frac{E_u}{12000}} \times 96 \right] \pm 6\%$	ma
Field Strength of Single- Field Ion-Trap Magnet		
(Approx.)**	$\sqrt{\frac{E_u}{12000}} \times 42$	gausses
Field Strength of Adjustable Centering Magnet		
	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	12000	14000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undelected			
Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC) .	96 $\pm$ 6%	104 $\pm$ 6%	ma
Ion-Trap Magnet			
(Rated Strength)	40	45	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

* In the 17QP4, grid No.3 which has the ultor function and collector are connected together within the tube and are conveniently referred to collectively as "ultor." The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

⁰⁰, **: See next page.

JULY 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



17QP4

KINESCOPE

17QP4

⁰⁰ For specimen focusing coil similar to JETEC Focusing Coil No. 109 positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference Line (see *Outline Drawing*). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a $14\frac{1}{4}'' \times 10\frac{3}{4}''$ picture area sharply focused at center of screen.

^{**} With a specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.111 located in optimum position and rotated to give maximum brightness, the ion-trap magnet current is 70 milliamperes dc when the ultor voltage is 12000 volts and grid-No.2 voltage of 300 volts.

*For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

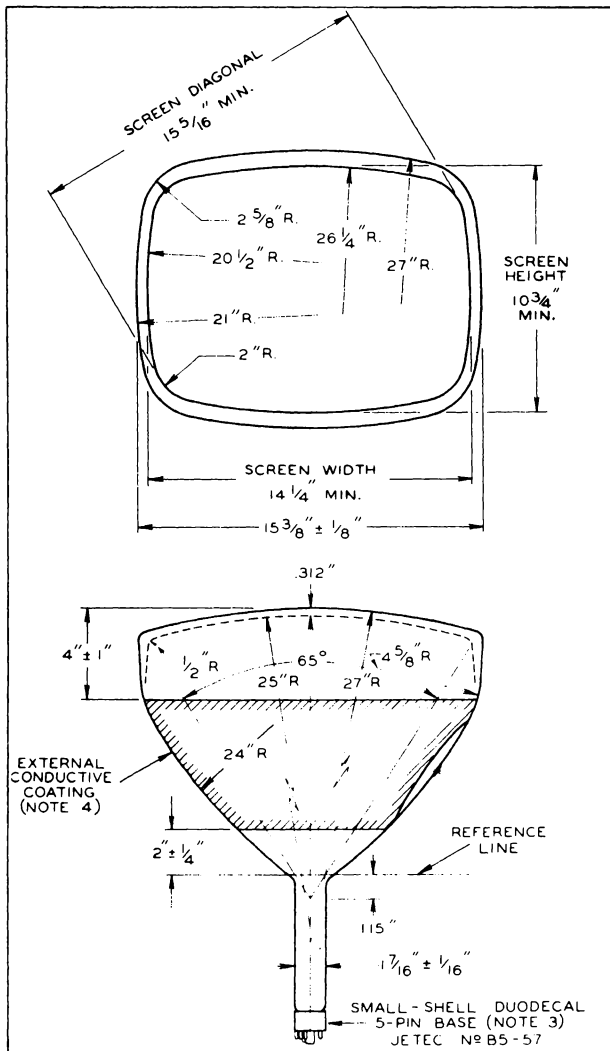
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17QP4



17QP4

KINESCOPE



JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

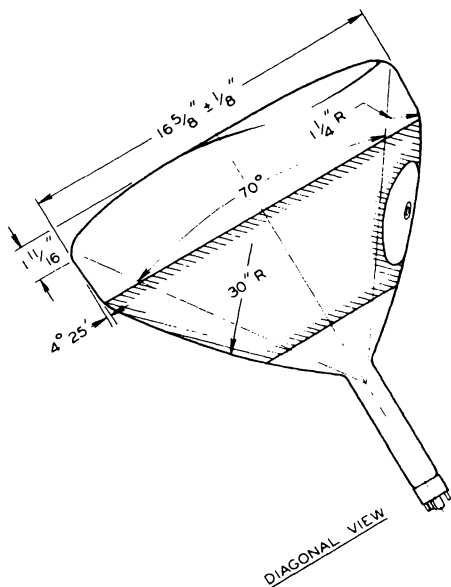
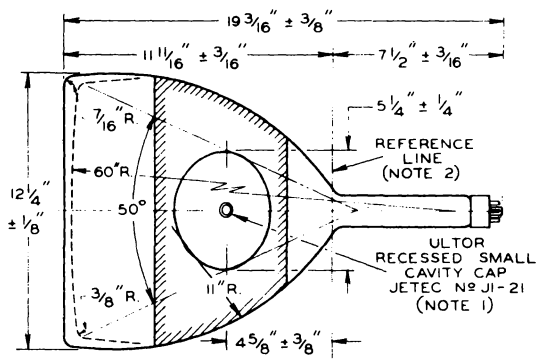
CE-7734R1A



17QP4

KINESCOPE

17QP4



92CL-7734 RI

JULY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7734R1B

17QP4



17QP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. BULB TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

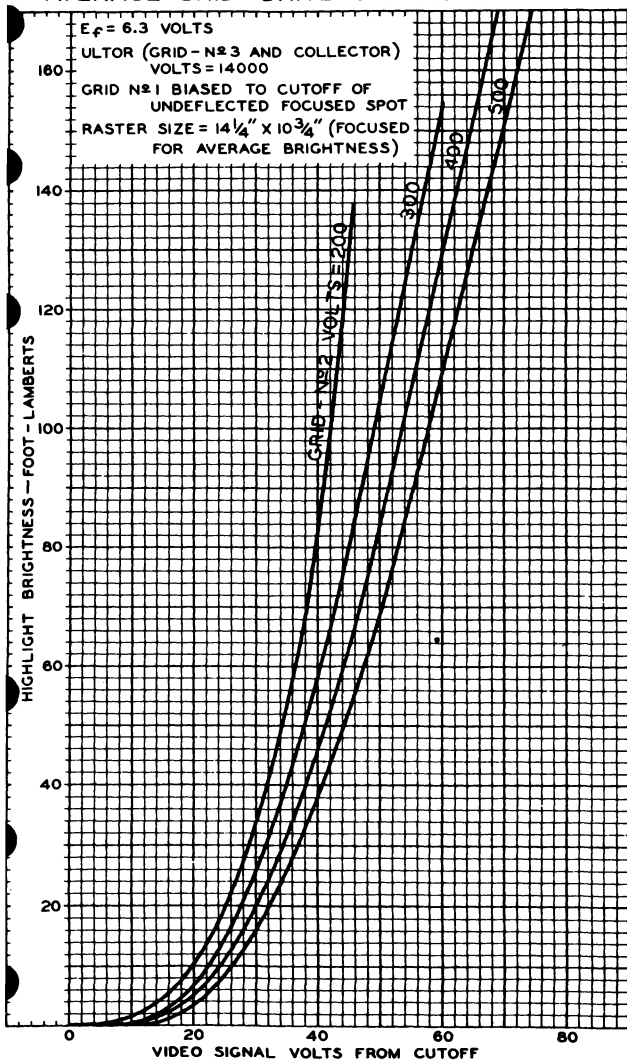
NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.



17QP4

17QP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 19, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

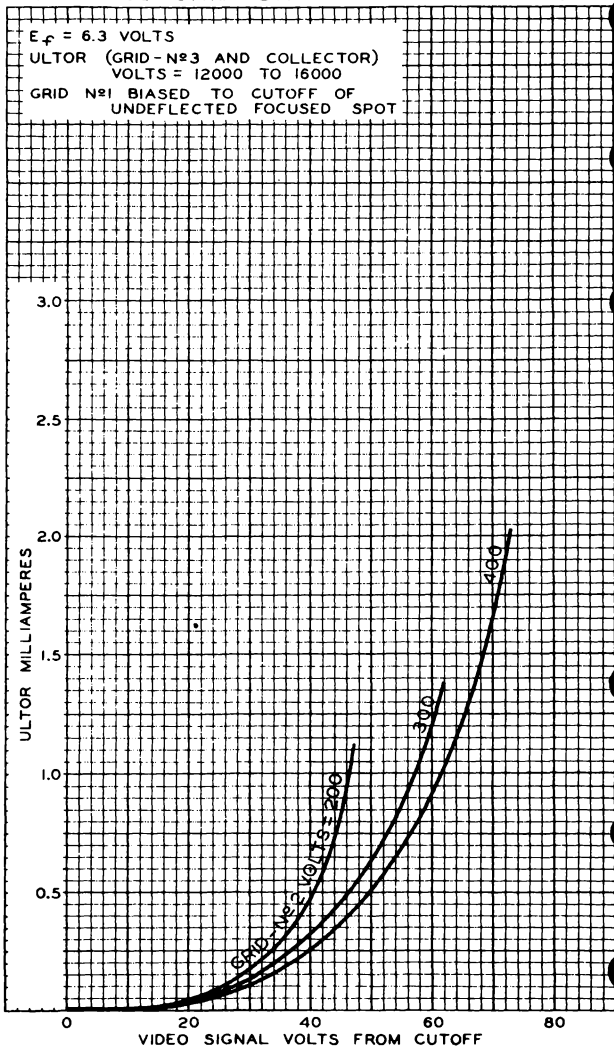
92CM-7755

17QP4



17QP4

AVERAGE GRID-DRIVE CHARACTERISTICS



DEC. 13. 1951

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7720



17QP4-A

KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

17QP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current 0.6 $\pm$ 10% amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μ f
Cathode to all other electrodes 5 μ f
External conductive coating to ultor. { 1500 max. μ f
750 min. μ f

Faceplate, Cylindrical Filterglass

Light transmission (Approx.) 72%

Phosphor (For curves, see front of this section). . P4—Sulfide Type

Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length 19-3/16" $\pm$ 3/8"

Greatest width 15-25/64" $\pm$ 1/8"

Greatest height. 12-9/32" $\pm$ 1/8"

Diagonal 16-5/8" $\pm$ 1/8"

Neck length 7-1/2" $\pm$ 3/16"

Screen Dimensions (Minimum):

Greatest width 14-1/4"

Greatest height. 10-3/4"

Diagonal 15-5/16"

Projected area 140 sq. in.

Weight (Approx.) 19 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J-133

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

Basing Designation for BOTTOM VIEW 12N

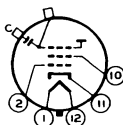
Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor
(Grid No.3,
Collector)

C - External
Conductive
Coating

17QP4-A



17QP4-A

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	18000 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3}) between 14000* and 18000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 500 volts

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC)°	$\left[\sqrt{\frac{E_{c3}}{16000}} \times 111 \right] \pm 10\%$	ma
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c3}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c3}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of		
and grid-No.2 voltage of		
	14000	volts
	300	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-28 to -72	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	28 to 72	volts
Focusing-Coil Current (DC).	104 $\pm$ 10%	ma
Minimum Field Strength of		
PM Ion-Trap Magnet.	31	gausses

* , ° , ** , § : see next page.



17QP4-A KINESCOPE

17QP4-A

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.
- For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (See *Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 14-1/4" x 10-3/4" picture size.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

DIMENSIONAL OUTLINE

for Type 17QP4-A is the same as that shown for Type 17LP4-A, except that the 17QP4-A has a Small-Shell Duodecal 5-Pin Base

HIGHLIGHT BRIGHTNESS vs DRIVE CURVES

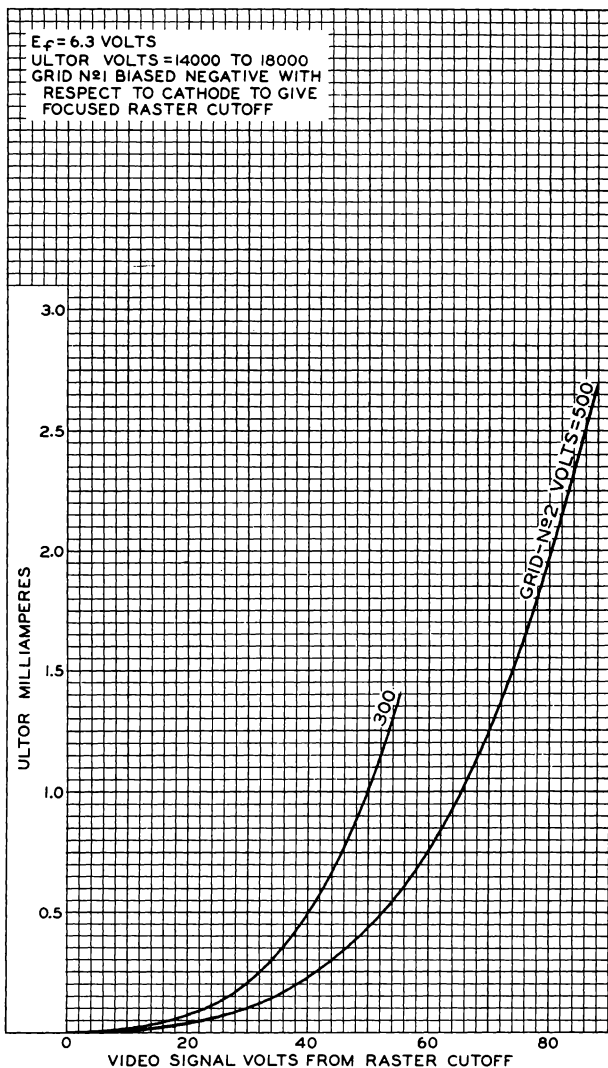
for Type 17QP4-A are the same as those shown for Type 17LP4-A

17QP4-A



17QP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8869



17TP4

KINESCOPE

RECTANGULAR METAL-SHELL TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

17TP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 6 μ f

Cathode to All Other Electrodes. 5 μ f

Face Plate (With about 66% light transmission) Frosted Altermglass

Phosphor (For Curves, see front of this Section) No.4- Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Maximum Overall Length 19-5/16"

Greatest Diagonal of Tube at Lip 16-13/16" $\pm$ 3/16"

Greatest Width of Tube at Lip 15-15/16" $\pm$ 1/8"

Greatest Height of Tube at Lip 12-1/4" $\pm$ 1/8"

Screen Size. 14-5/8" x 11"

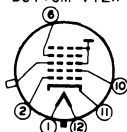
Mounting Position. Any

Ultor® Terminal. Metal-Shell Lip

Base Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode



Pin 12 - Heater
Metal-Shell Lip -
Grid No.3,
Grid No.5,
Collector

Maximum Ratings, Design-Center Values:

ULTOR® VOLTAGE 16000 max. volts

GRID-No.4 VOLTAGE. 500 max. volts

GRID-No.2 VOLTAGE. 500 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode. 180 max. volts

• See next page

OCTOBER 1, 1951

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17TP4



17TP4 KINESCOPE

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000* and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 500 volts

Grid-No.4 Voltage for Focus		
With Ultor Current of 100 μ amp	0% to 2.5% of E_u	volts
Grid-No.1 Voltage for Visual Extinction of Undelected		
Focused Spot	11% to 25.7% of E_{c2}	volts
Grid-No.4 Current	-25 to +25	μ amp
Grid-No.2 Current	-15 to +15	μ amp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)**	$\sqrt{\frac{E_u}{12000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of. . .	14000	16000	volts
and grid-No.2 voltage of.	300	300	volts
Grid-No.4 Voltage for Focus			
With Ultor Current of			
100 μ amp	0 to 350	0 to 400	volts
Grid-No.1 Voltage†	-33 to -77	-33 to -77	volts
Ion-Trap Magnet			
(Rated Strength)	35	40	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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- In the 17TP4, grid No.5 which has the ultor function, grid No.3, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

- ** With a specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No. 111 located in optimum position and rotated to give maximum brightness, the ion-trap magnet current is 65 milliamperes dc when the ultor voltage is 14000 volts.

- † For visual extinction of undeflected focused spot.



17TP4 KINESCOPE

17TP4

OPERATING NOTES

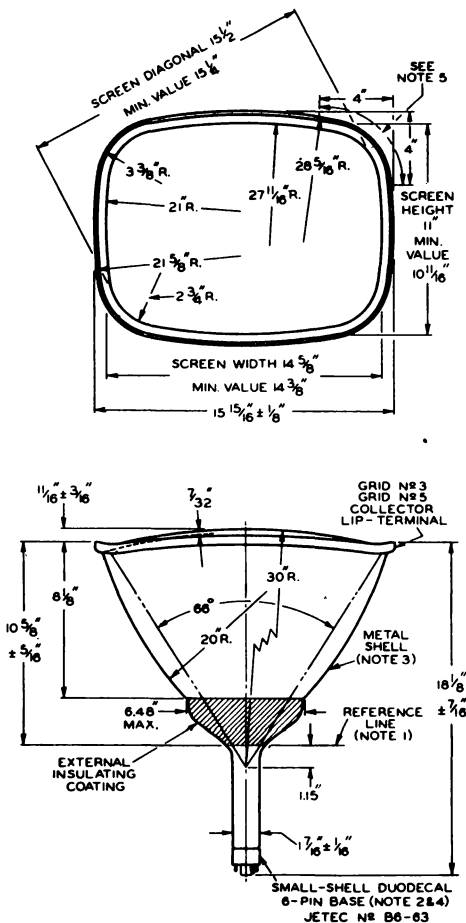
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 17TP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 17.6 kilovolts (absolute value), shielding of the 17TP4 for x-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Direction of the field of the ion trap magnet should be such that the north pole is adjacent to vacant pin position No. 8 and the south pole to pin No. 2.

17TP4



17TP4 KINESCOPE



OCTOBER 1, 1951

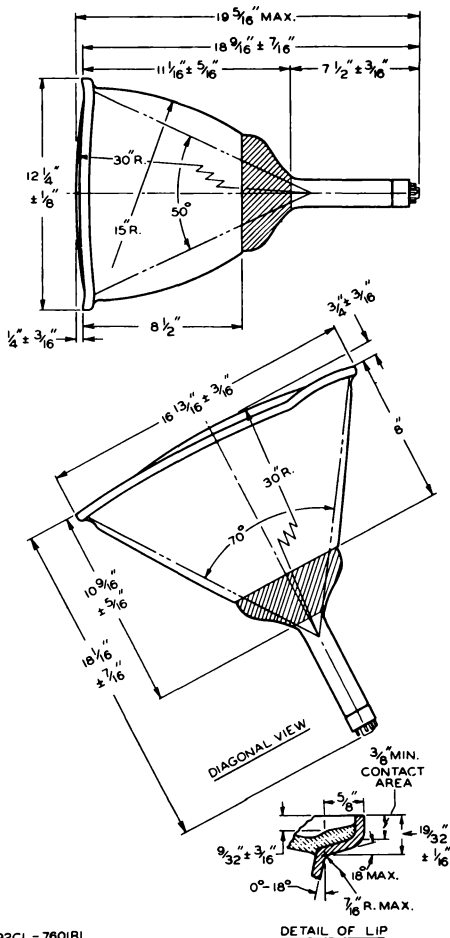
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7601R1A



I7TP4 KINESCOPE

I7TP4



92CL-7601RI

OCTOBER 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7601R18

17TP4



17TP4

KINESCOPE

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.

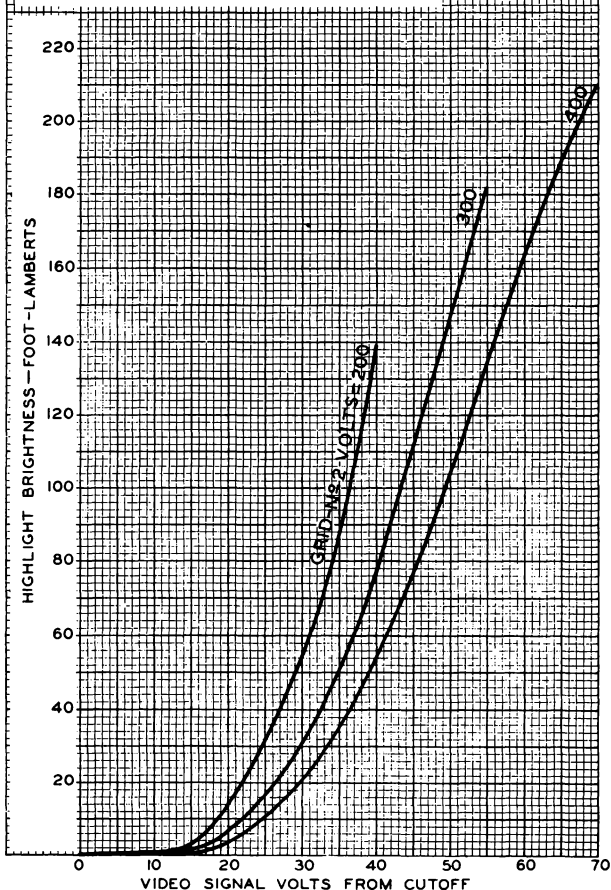
NOTE 5: SUPPORT TUBE BY LIP ONLY AT CORNERS WITHIN THIS SPACE.



17TP4

17TP4

AVERAGE GRID-DRIVE CHARACTERISTICS

 $E_f = 6.3$ VOLTSULTOR (GRIDS-N $\circ$ 3 & N $\circ$ 5
AND COLLECTOR) VOLTS = 14000GRID-N $\circ$ 4 VOLTS ADJUSTED TO GIVE FOCUS
AT AVERAGE RASTER BRIGHTNESSGRID N $\circ$ 1 BIASED TO CUTOFF OF
UNDEFLECTED FOCUSED SPOTRASTER SIZE = $14 \frac{5}{8}$ " x 11"

FEB. 8, 1951

TUBE DEPARTMENT

92CM-7606

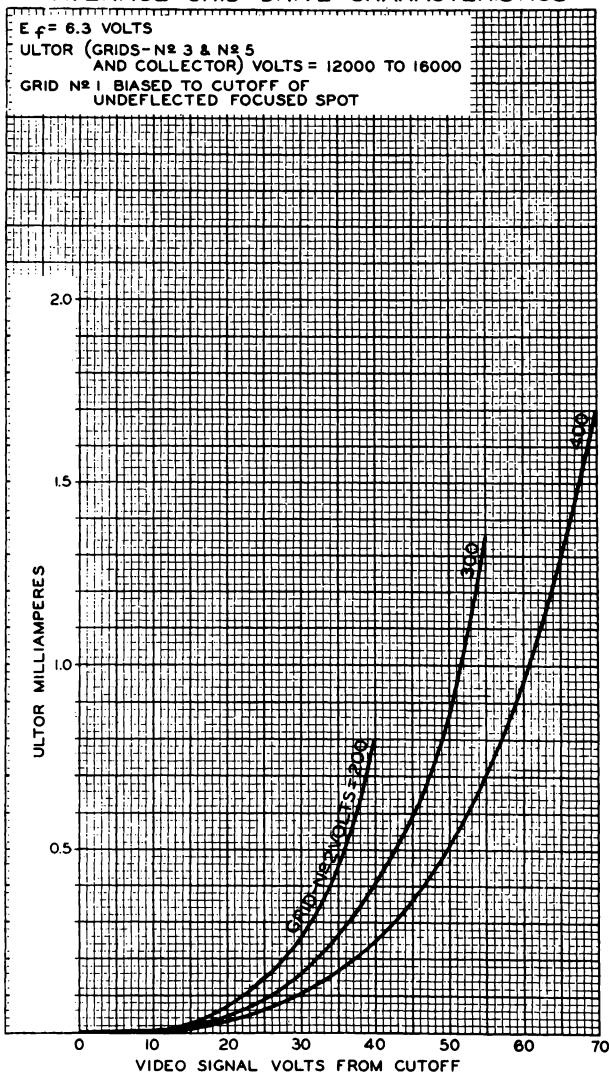
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17TP4



17TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 8, 1951

TUBE DEPARTMENT

92CM-7607

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



19AP4

KINESCOPE

**19AP4
19AP4-A**

The 19AP4 is like the 19AP4-B except that it has a face plate made of *unfrosted, clear glass*. As a result, the light output is about 30% greater than shown by the curves under Type 19AP4-B.

19AP4-A

KINESCOPE

The 19AP4-A is like the 19AP4-B except that it has an *unfrosted Filterglass* face plate. The light output is essentially the same as that of the Type 19AP4-B.

*As soon as feasible, the 19AP4-B will supersede
the 19AP4 and 19AP4-A.*



19AP4 - B KINESCOPE

METAL-CONE ENVELOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

Supersedes Type 19AP4-A

19AP4-B

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 7 μ f

Cathode to All Other Electrodes. 5 μ f

Face Plate. Frosted RCA "Filterglass"

Phosphor (For Curves, see front of this Section) No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence. Medium

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angle (Approx.) 66°

Ion-Trap Gun Requires External Single-Field Magnet

Overall Length 21-1/2" $\pm$ 1/2"

Greatest Diameter of Envelope. 18-5/8" $\pm$ 1/8"

Screen Diameter. 17-3/8"

Mounting Position. Any

Anode Terminal Metal-Cone Lip

Base Small-Shell Duodecal 5-Pin

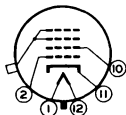
Basing Designation for BOTTOM VIEW 12D1

Pin 1-Heater

Pin 2-Grid No.1

Pin 10-Grid No.2

Pin 11-Cathode



Pin 12-Heater

Metal-Cone Lip:

Anode,

Grid No.3

Maximum Ratings, Design-Center Values:

ANODE[□] VOLTAGE. 19000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds . . . 410 max. volts

After equipment warm-up period . . . 150 max. volts

Heater positive with respect to cathode. 150 max. volts

□ Anode and grid No.3, which are connected together within tube, are referred to herein as anode.

● The product of anode voltage and average anode current should be limited to 6 watts.

▲ Has transmission of about 65%.



19AP4-B KINESCOPE

Typical Operation:

Anode Voltage*	12000	14000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC, Approx.) [‡]	140	150	ma
Ion-Trap Magnet Current (DC, Approx.) [§]	75	80	ma
Field Strength of Single-Field, Ion-Trap Magnet (Approx.) [†]	45	50	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 ma. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance.	150 min.	ohms
Grid-No.2-Circuit Resistance.	470 min.	ohms
Anode-Circuit Resistance	22000 min.	ohms

The resistors used should be capable of withstanding the applied voltage.

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 12000 volts.

‡ For JETEC Focusing Coil No.106, or equivalent, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 18 foot-lamberts for 12000 volts, or 22 foot-lamberts for 14000 volts, on a 15-5/8" x 11-3/4" picture area.

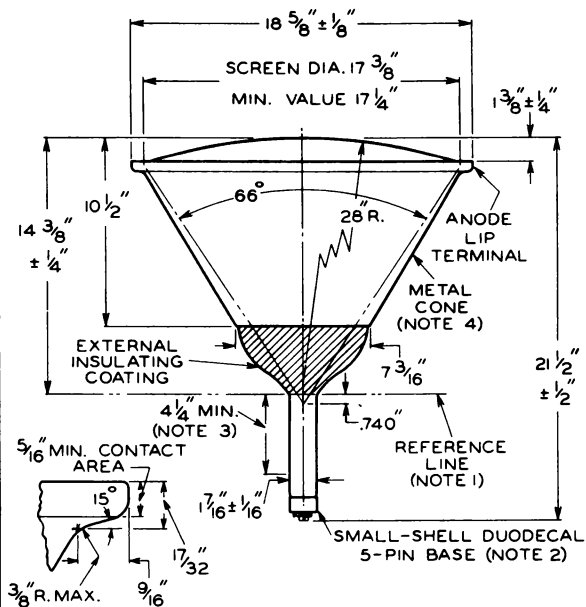
§ For JETEC Ion-Trap Magnet No.111, or equivalent, located in optimum position and rotated to give maximum brightness.

† Measured at center of field with General Electric Gauss Meter, Cat. No. 409X51.



19AP4-B KINESCOPE

19AP4-B



DETAIL OF LIP

92CM-7502R1

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE $1.500" + .003" - .000"$ I.D. AND 2" LONG WILL REST ON CONE.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH CONE AXIS AND HAVING DIAMETER OF 3".

NOTE 3: LOCATION OF DEFLECTING YOKE AND FOCUSING COIL MUST BE WITHIN THIS SPACE.

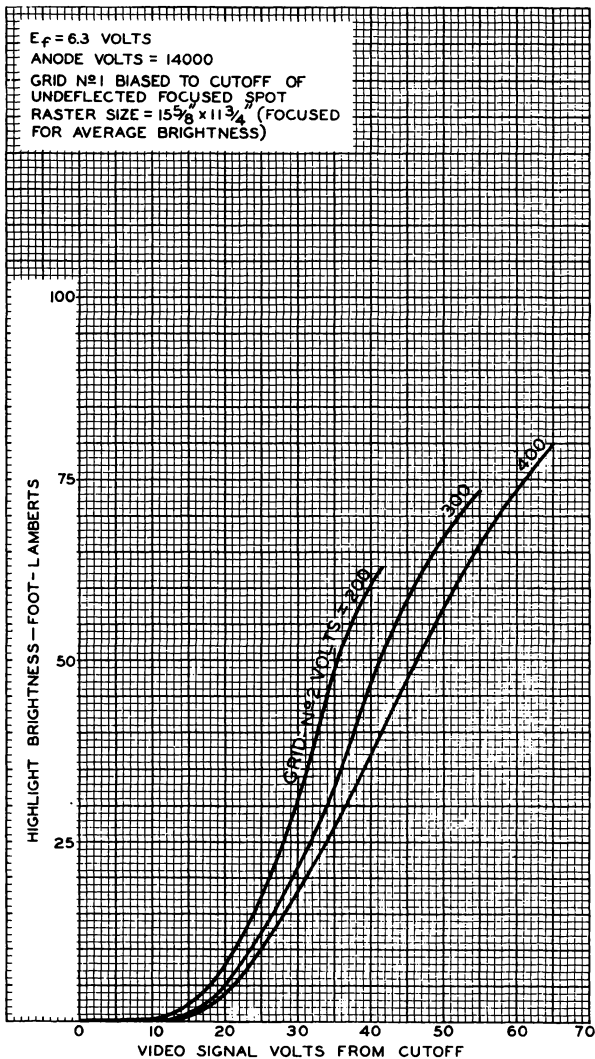
NOTE 4: METAL CONE AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE CONE OR THE FACE MUST HAVE INSULATING PROPERTIES ADEQUATE TO WITHSTAND THE APPLIED ANODE VOLTAGE PLUS 10%.

19AP4-B



19AP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



JULY 5, 1950

TUBE DEPARTMENT

92CM-7508

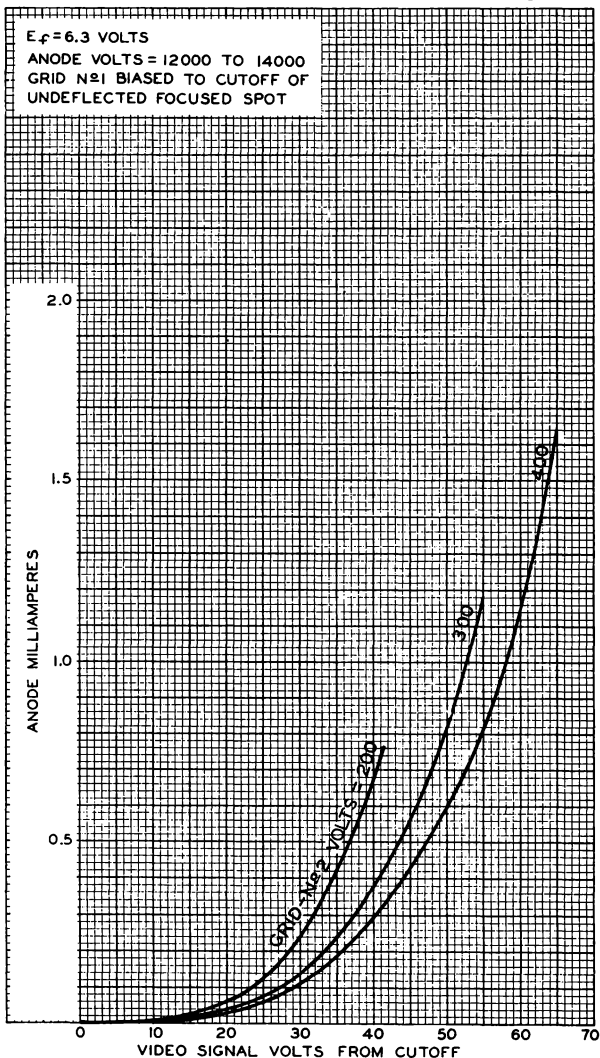
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



19AP4-B

19AP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



JULY 3, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7506



19AP4-D

KINESCOPE

19AP4-D

The 19AP4-D is like the 19AP4-B except that it has a face plate made of *frosted, clear glass*. As a result, the light output is about 30% greater than shown by the curves under Type 19AP4-B.

*As soon as feasible, the 19AP4-B will supersede
the 19AP4-D.*



20CP4

20CP4 KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 6 μf
Cathode to All Other Electrodes. 5 μf

Face Plate (With about 66% light transmission) Filterglass

Phosphor (For Curves, see front of this Section) No.4-Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Overall Length 21-7/16" $\pm$ 3/8"Greatest Diagonal of Tube at Face. 20-3/32" $\pm$ 3/16"Greatest Width of Tube at Face 18-11/16" $\pm$ 3/16"Greatest Height of Tube at Face. 14-15/16" $\pm$ 3/16"

Screen Size. 17-1/4" x 13-1/4"

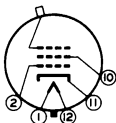
Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

BOTTOM VIEW

Pin 1-Heater
Pin 2-Grid No.1
Pin 10-Grid No.2



Pin 11-Cathode
Pin 12-Heater
Cap-Anode

Maximum Ratings, Design-Center Values:

ANODE VOLTAGE. 18000 max. volts

GRID-No.2 VOLTAGE. 410 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not

exceeding 15 seconds . . . 410 max. volts

After equipment warm-up period . . . 150 max. volts

Heater positive with respect to cathode. 150 max. volts

MAY 1, 1951

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

20CP4



20CP4

KINESCOPE

Typical Operation:

Anode Voltage*	14000	16000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC)†	104 ± 10%	110 ± 10%	ma
Field Strength of Single- Field, Ion-Trap Magnet (Approx.)†	50	55	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 14000 volts.

□ For specimen focusing coil similar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 17" x 12-3/4" picture area sharply focused at center of screen.

† Measured at center of field with General Electric Gauss Meter, Cat. No.409X51.



20CP4

KINESCOPE

20CP4

OPERATING NOTES

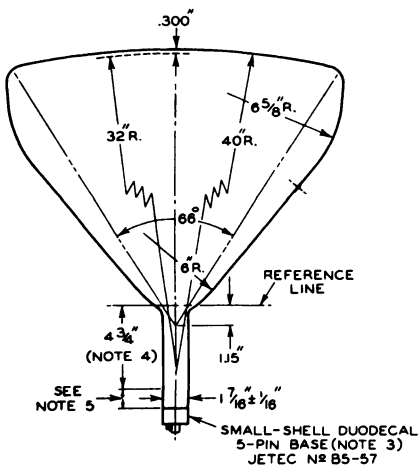
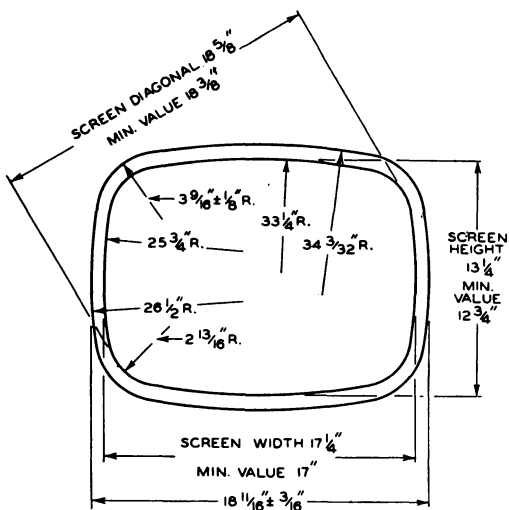
X-Ray Warning. When operated at or below 16000 volts, the 20CP4 does not produce any harmful x-ray radiation. In general, picture tubes may be operated at voltages (if ratings permit) up to 16000 volts without personal injury on prolonged exposure at close range. Above 16000 volts, special shielding precautions for x-ray radiation may be necessary.

Direction of the field of the ion-trap magnet should be such that the north pole is adjacent to vacant pin position No.8 and the south pole to pin No.2.



20CP4

KINESCOPE



MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

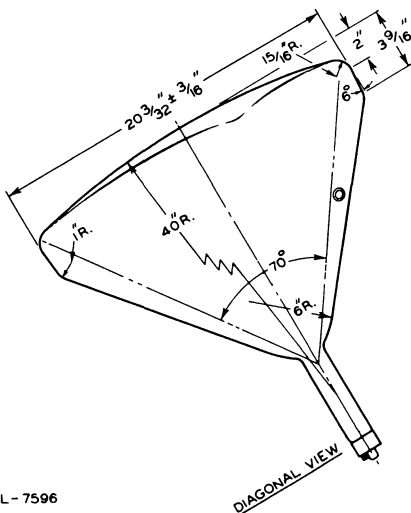
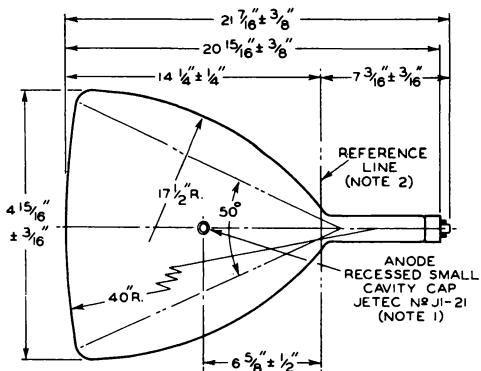
CE-7596A



20CP4

KINESCOPE

20CP4



92CL-7596

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7596B

20CP4



20CP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.

NOTE 5: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET.



20CP4

20CP4

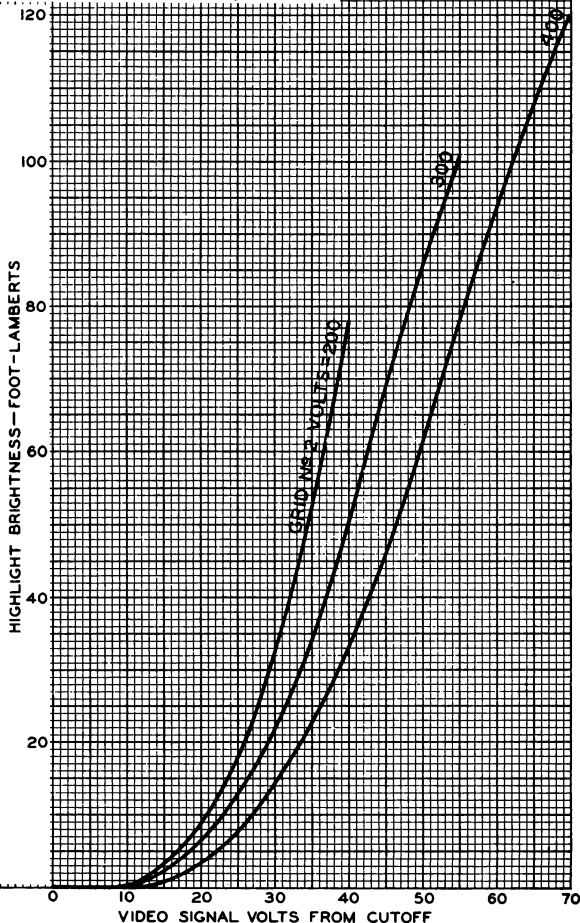
AVERAGE GRID-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS

ANODE VOLTS = 16000

GRID N° 1 BIASED TO CUTOFF OF UNDEFLECTED FOCUSED SPOT

RASTER SIZE $17 \frac{1}{4} \times 13 \frac{1}{4}$ " (FOCUSED FOR AVERAGE BRIGHTNESS)



MAR. 22, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

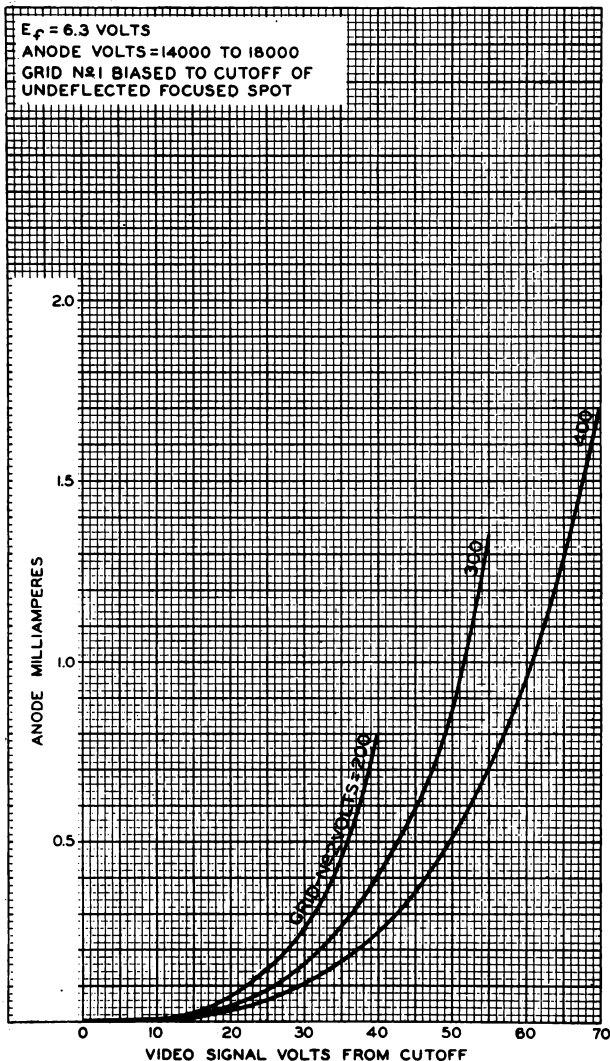
92CM-7616

20CP4



20CP4

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 26, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7618



20DP4-A

20DP4-A/20CP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

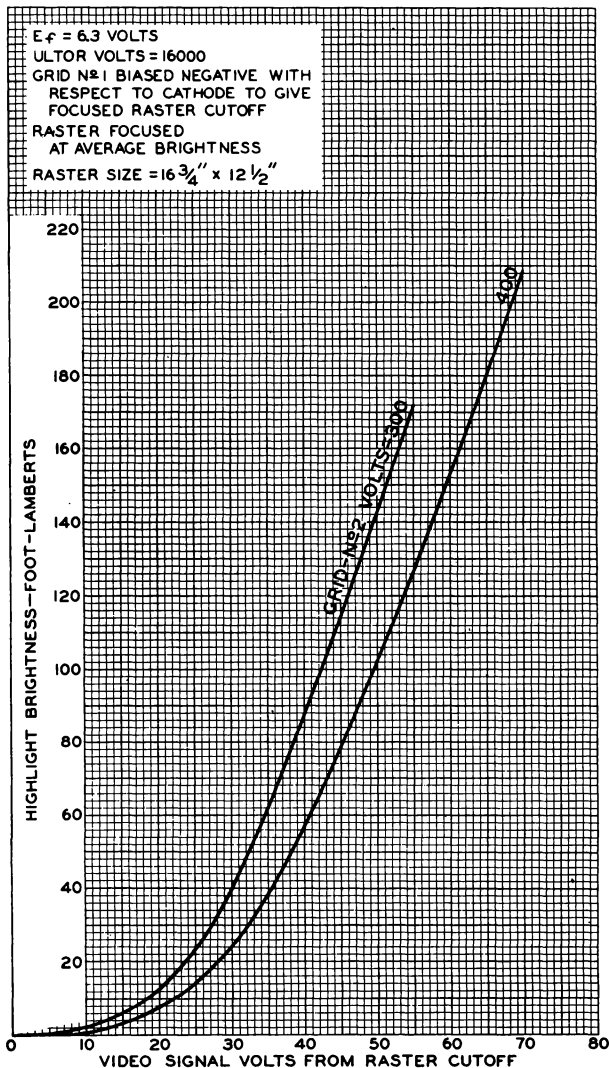
The 20DP4-A/20CP4-A is the same as the 20DP4-C/20CP4-D except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

20DP4-A



20DP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8865



20DP4-C/20CP4-D

KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

20DP4-C

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf
Cathode to all other electrodes. 5 μf
External conductive coating to ultor $\begin{cases} 750 \text{ max. } \mu\text{f} \\ 500 \text{ min. } \mu\text{f} \end{cases}$

Faceplate, Spherical Filterglass

Light transmission (Approx.) 73%

Phosphor (For curves, see front of this Section). . P4—Sulfide Type

Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°
Horizontal 66°
Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $21-9/16" \pm 5/16"$
Greatest width $18-11/16" \pm 1/8"$
Greatest height. $14-15/16" \pm 1/8"$
Diagonal $20-3/32" \pm 1/8"$
Neck length. $7-5/16" \pm 1/8"$

Screen Dimensions (Minimum):

Greatest width 17"
Greatest height. $12-3/4"$
Diagonal $18-3/8"$
Projected area 199 sq. in.

Weight (Approx.) 30 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J-161

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

Basing Designation for BOTTOM VIEW 12N

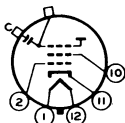
Pin 1 — Heater

Pin 2 — Grid No.1

Pin 10 — Grid No.2

Pin 11 — Cathode

Pin 12 — Heater



Cap — Ultor
(Grid No.3,
Collector)
C — External
Conductive
Coating



20DP4-C

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	18000 max.	volts
GRID-No.2 VOLTAGE.	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3}) between 14000* and 18000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 410 volts

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC) ^o	$\left[\sqrt{\frac{E_{c3}}{16000}} \times 110 \right] \pm 10\%$	ma
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c3}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c3}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of		14000	16000	volts
and grid-No.2 voltage of		300	300	volts
Grid-No.1 Voltage for				
Visual Extinction of				
Focused Raster.	-28 to -72	-28 to -72	volts	
Grid-No.1 Video Drive				
from Raster Cutoff				
(Black Level):				
White-level value				
(Peak positive)	28 to 72	28 to 72	volts	
Focusing-Coil Current (DC)	103 $\pm$ 10%	110 $\pm$ 10%	ma	
Minimum Field Strength of				
PM Ion-Trap Magnet.	31	33	gausses	

*_o, **_§: See next page.



20DP4-C KINESCOPE

20DP4-C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

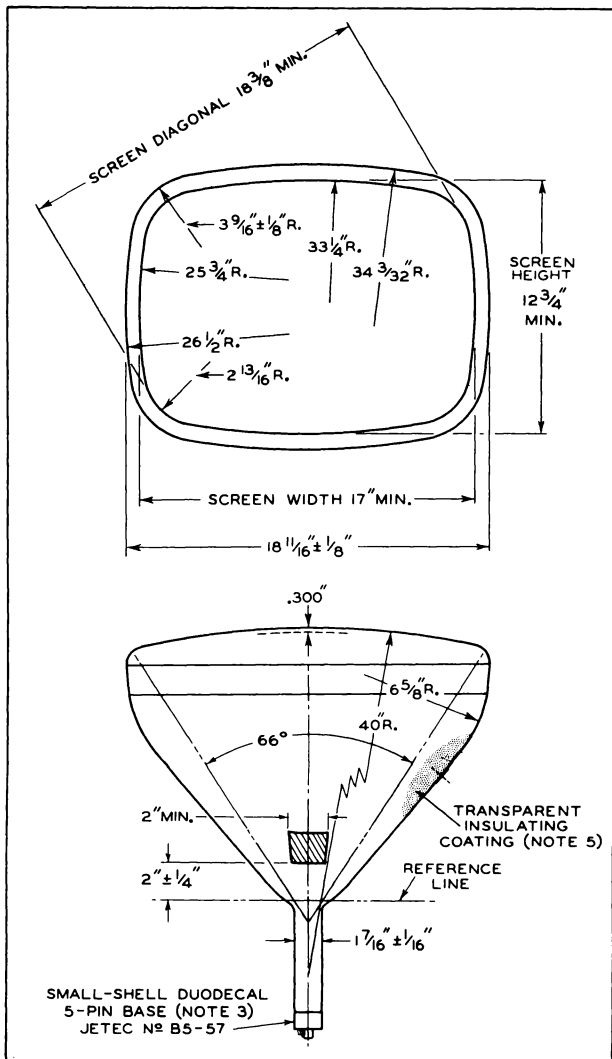
- * Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.
- o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (See *Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 17" x 12-3/4" picture size.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

20DP4-C



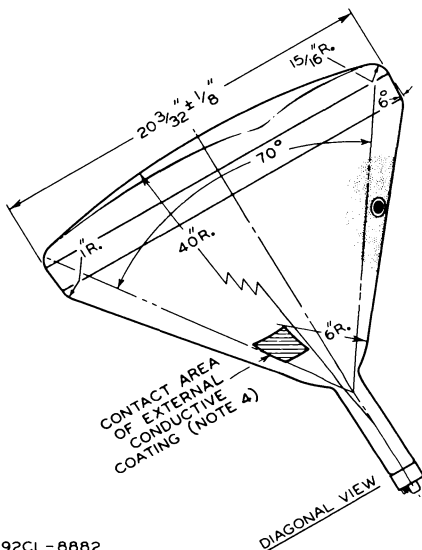
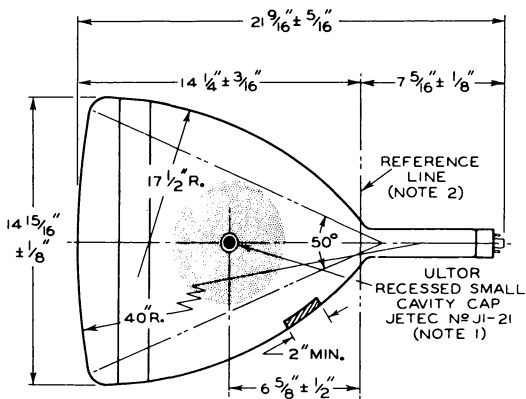
20DP4-C KINESCOPE





20DP4-C KINESCOPE

20DP4-C



92CL-8882

20DP4-C



20DP4-C

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

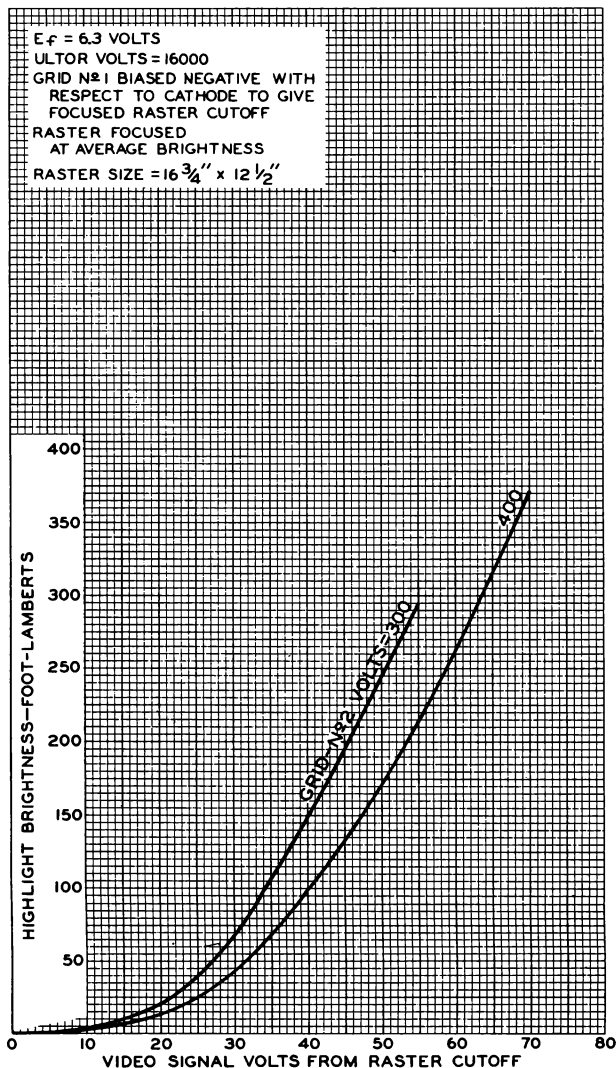
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.



20DP4-C

20DP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

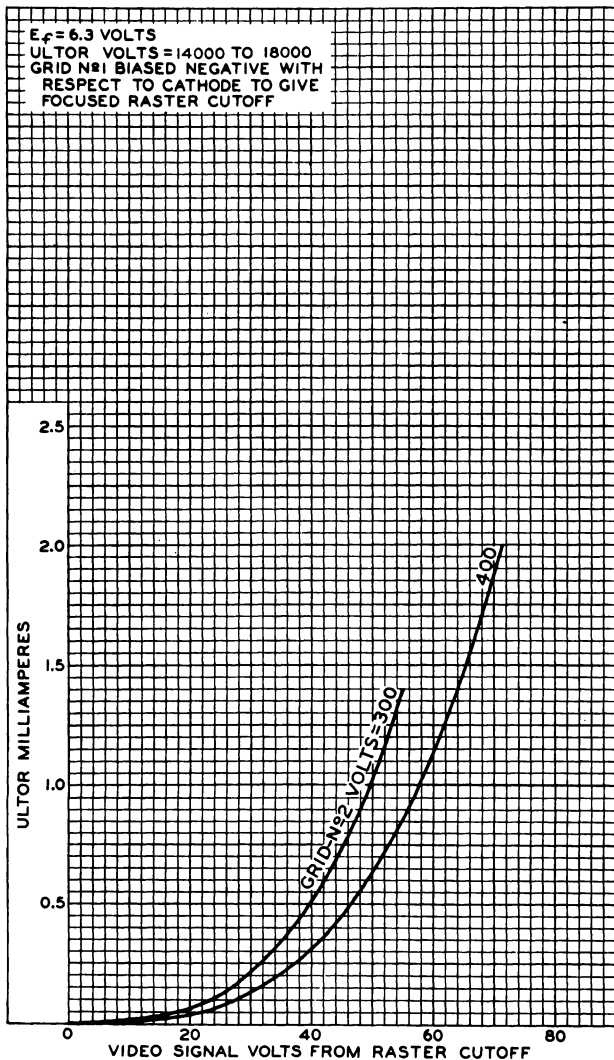
92CM-8866

20DP4-C



20DP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS





20HP4-A

20HP4-A/20MP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

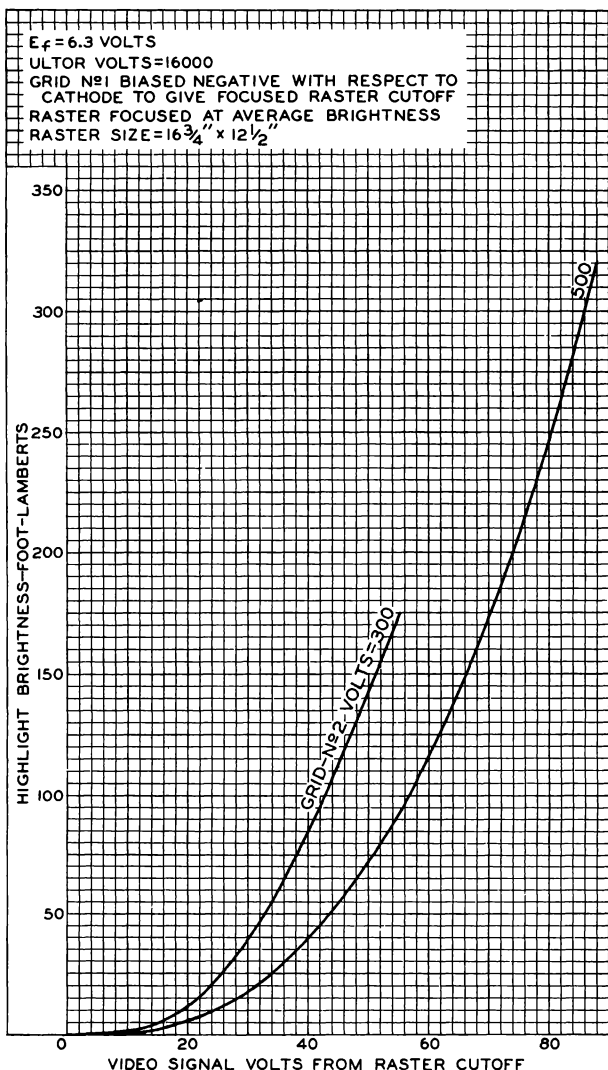
The 20HP4-A/20MP4 is the same as the 20HP4-D except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

20HP4-A



20HP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

92CM-8841

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



20HP4 - D

KINESCOPE

20HP4-D

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf

Cathode to all other electrodes. 5 μf

External conductive coating to ultor $\left\{ \begin{array}{l} 1500 \text{ max. } \mu\text{f} \\ 750 \text{ min. } \mu\text{f} \end{array} \right.$

Faceplate, Spherical Filterglass

Light transmission (Approx.) 73%

Phosphor (For curves, see front of this Section). . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $21\text{--}3/4" \pm 3/8"$

Greatest width $18\text{--}11/16" \pm 1/8"$

Greatest height. $14\text{--}15/16" \pm 1/8"$

Diagonal $20\text{--}3/32" \pm 1/8"$

Neck length. $7\text{--}1/2" \pm 3/16"$

Screen Dimensions (Minimum):

Greatest width 17"

Greatest height. $12\text{--}3/4"$

Diagonal $18\text{--}3/8"$

Projected area 199 sq. in.

Weight (Approx.) 30 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J-161

Base Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1 - Heater

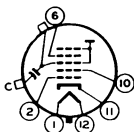
Pin 2 - Grid No.1

Pin 6 - Grid No.4

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor

(Grid No.3,

Grid No.5,

Collector)

C - External

Conductive

Coating



20HP4 - D

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

*With any ultor voltage (E_{c5}) between 14000# and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 500 volts*

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp.	-0.4% to +2.2% of E_{c5}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive from		
Raster Cutoff (Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.4 Current.	-25 to +25	μ amp
Grid-No.2 Current.	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c5}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c5}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.



20HP4-D

KINESCOPE

20HP4-D

Examples of Use of Design Ranges:

With ultor voltage of	14000	16000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp. . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet . . .	31	33	gausses

Maximum Circuit Values:

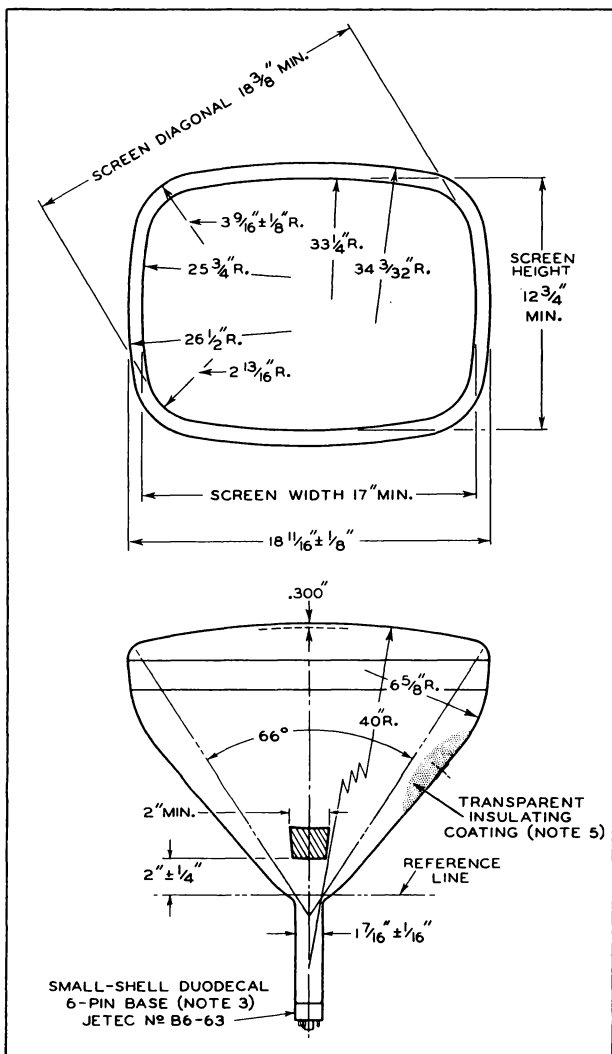
Grid-No.1-Circuit Resistance.	1.5 max.	megohms
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*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

20HP4-D



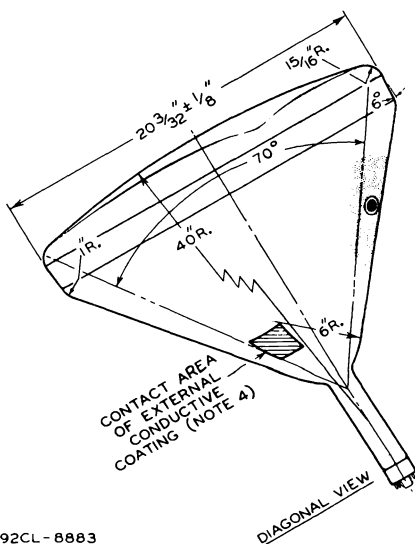
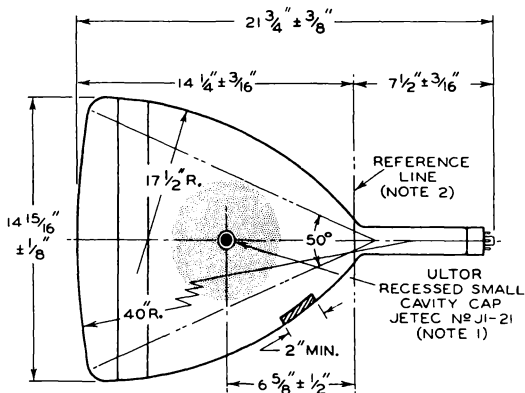
20HP4-D KINESCOPE





20HP4-D KINESCOPE

20HP4-D



92CL-8883

20HP4-D



20HP4-D KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.



20HP4-D

20HP4-D

AVERAGE GRID-DRIVE CHARACTERISTICS

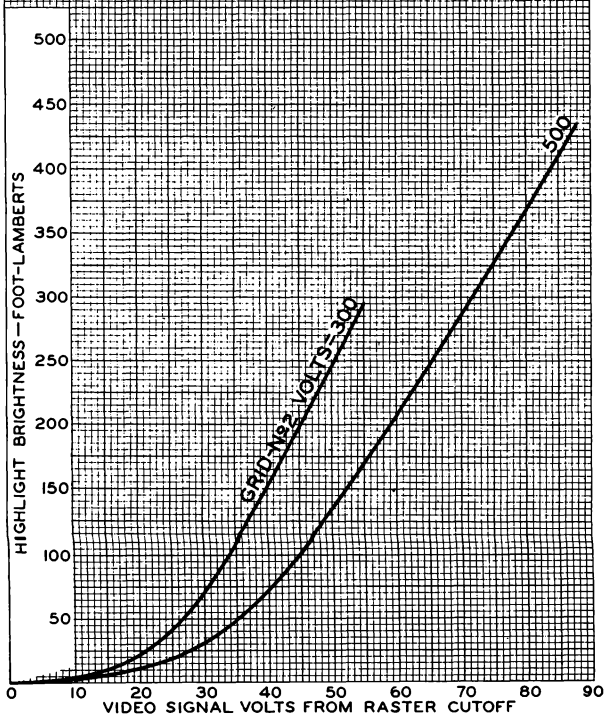
$E_f = 6.3$ VOLTS

ULTOR VOLTS=16000

GRID No1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF

RASTER FOCUSED AT AVERAGE BRIGHTNESS

RASTER SIZE $16\frac{3}{4}'' \times 12\frac{1}{2}''$



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

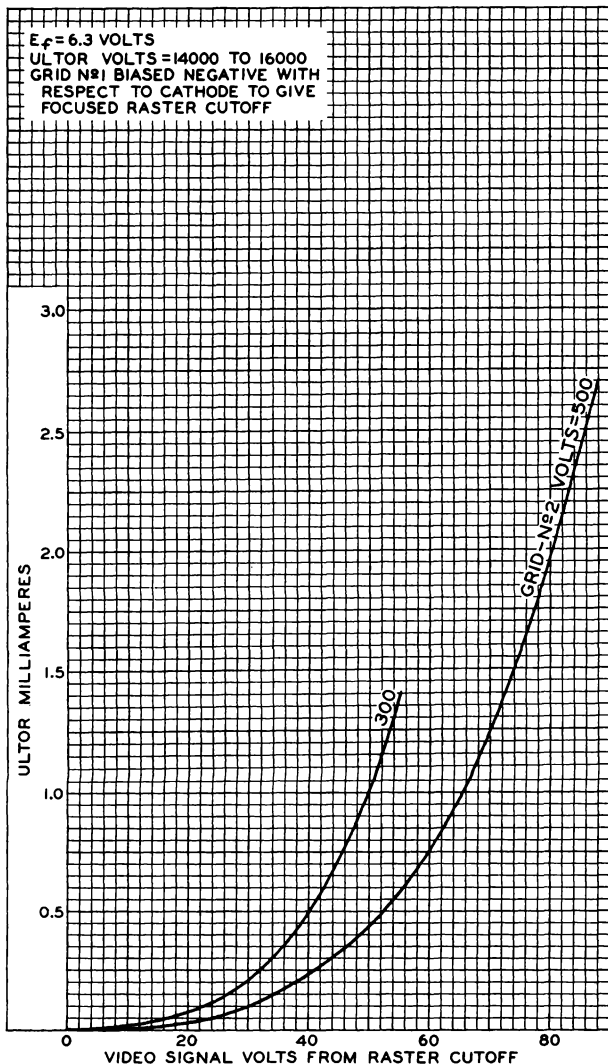
92CL-8867

20HP4-D



20HP4-D

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8871



21ACP4-A

KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

21ACP4-A

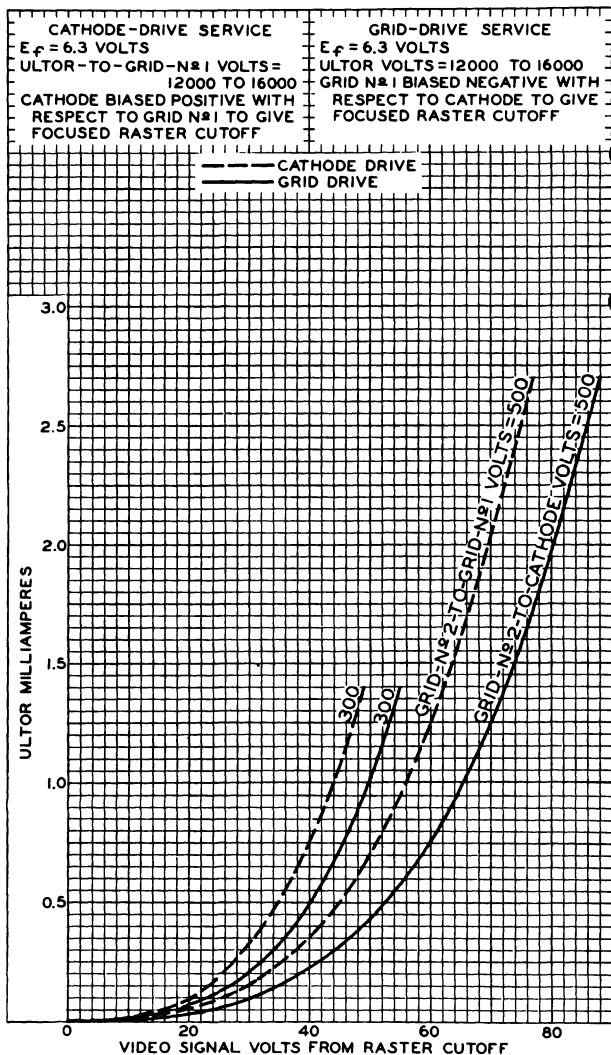
The 21ACP4-A is the same as the 21AMP4-A except that it has a *maximum ultor voltage rating* of 20000 volts and has ULTOR CURRENT vs DRIVE curves as shown on the back of this sheet.

21ACP4-A



21ACP4-A

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8904



21ALP4-A KINESCOPE

21ALP4-A

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 $\mu\mu\text{f}$

Cathode to all other electrodes 5 $\mu\mu\text{f}$

External conductive coating to ultor* { 750 max. $\mu\mu\text{f}$
500 min. $\mu\mu\text{f}$

Faceplate, Spherical Filterglass

Light transmission (Approx.) 75%

Phosphor (For curves, see front of this Section) . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $20" \pm 3/8"$

Greatest width $20-1/4" \pm 1/8"$

Greatest height $16-3/8" \pm 1/8"$

Diagonal $21-3/8" \pm 1/8"$

Screen Dimensions (Minimum):

Greatest width $19-1/8"$

Greatest height $15"$

Diagonal $20-1/4"$

Projected area 255 sq. in.

Weight (Approx.) 24 lbs

Mounting Position Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J171 (90°)

Base Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

Basing Designation BOTTOM VIEW 12L

Pin 1 - Heater

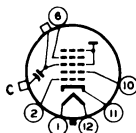
Pin 2 - Grid No.1

Pin 6 - Grid No.4

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor

(Grid No.3,

Grid No.5,

Collector)

C - External

Conductive

Coating

*: See next page.

← Indicates a change.

NOV. 1, 1955

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2IALP4-A



2IALP4-A

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR [®] VOLTAGE	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value [*]	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds. . .	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 14000[#] and 18000 volts
and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp. . .	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from		
Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.4 Current.	-25 to +25	μ amp
Grid-No.2 Current.	-15 to +15	μ amp
→ Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c5k}}{16000}} \times 30$	ma
→ Minimum Field Strength of		
PM Ion-Trap Magnet§. . .	$\sqrt{\frac{E_{c5k}}{16000}} \times 33$	gausses
Field Strength of Adjust-		
able Centering Magnet. .	0 to 8	gausses

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

[•], ^{*}, [#], ^{**}, [§]: See next page.

→ Indicates a change.

NOV. 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1



21ALP4-A

KINESCOPE

21ALP4-A

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	16000	18000	volts
<i>and grid-No.2 voltage of</i>	300	400	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp. . . .	-65 to +350	-75 to +400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-37 to -96	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

CATHODE-DRIVE[®] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR [®] -TO-GRID-No.1 VOLTAGE.	18000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*.	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value.	125 max.	volts
Negative bias value.	0 max.	volts
Negative peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

• The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21ALP4-A, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 21ALP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

■ cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

*, **, §: See next page.

← Indicates a change.

2IALP4-A



2IALP4-A KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 14000* and 18000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp. 0% to 2.6% of E_{c5g1} volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster. 8.5% to 19.4% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 8.5% to 19.4% of E_{c2g1} volts

Grid-No.4 Current.

-25 to +25 μ amp

Grid-No.2 Current.

-15 to +15 μ amp

→ Ion-Trap Magnet Current

(Average)**

$\sqrt{\frac{E_{c5g1}}{16000}} \times 30$ ma

→ Minimum Field Strength of PM

Ion-Trap Magnet§

$\sqrt{\frac{E_{c5g1}}{16000}} \times 33$ gauss

Field Strength of Adjustable

Centering Magnet

0 to 8 gauss

Examples of Use of Design Ranges:

With ultor-to-grid-No.1

voltage of 16000 18000 volts

and grid-No.2-to-grid-No.1

voltage of 300 400 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp. 0 to 415 0 to 470 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster. 25 to 58 34 to 78 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 25 to 58 34 to 78 volts

→ Minimum Field Strength of

PM Ion-Trap Magnet

33 35 gauss

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

*, **, §: See next page.

→ Indicates a change.

NOV. 1, 1955

TUBE DIVISION

DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



2IALP4-A KINESCOPE

2IALP4-A

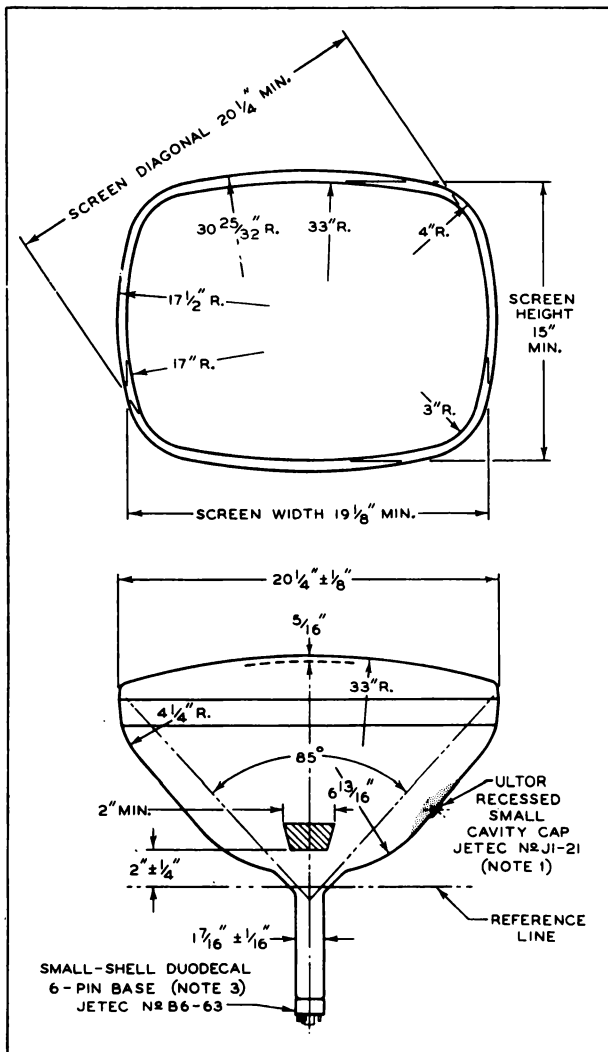
- # Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 14000 volts.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

2IALP4-A



2IALP4-A KINESCOPE



NOV. 1, 1955

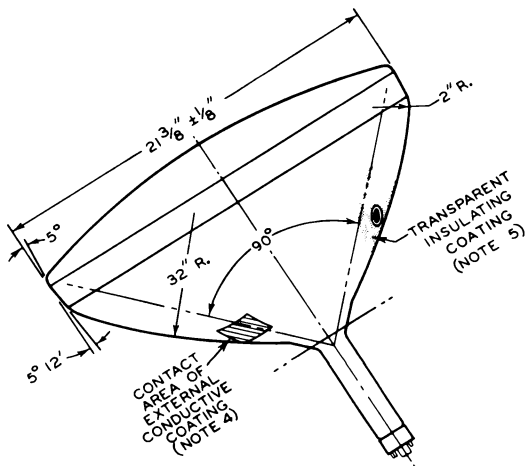
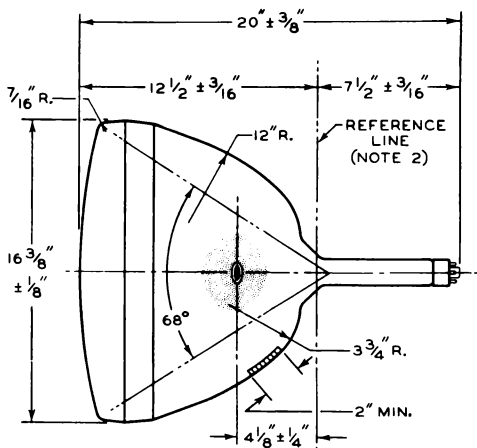
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8342R2A



21ALP4-A KINESCOPE

21ALP4-A



92CL-8342R2

NOV. 1, 1955

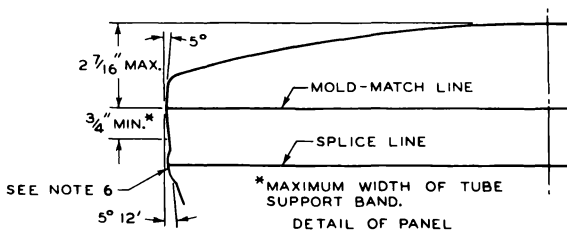
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8342R2B

2IALP4-A



2IALP4-A KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16$ " BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

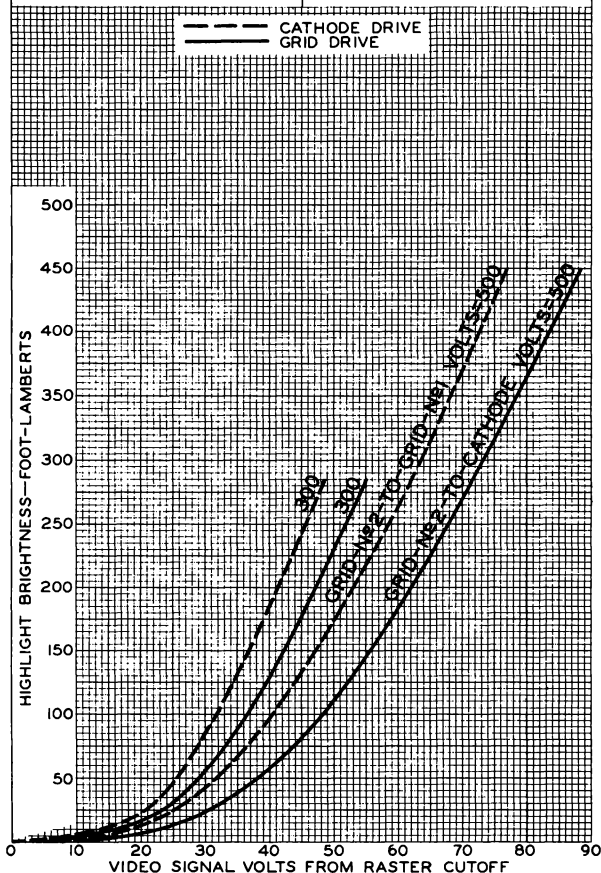


21ALP4-A

21ALP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE $E_f = 6.3$ VOLTS ULTOR-TO-GRID- $N\#1$ VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID $N\#1$ TO GIVE FOCUSED RASTER CUTOFF RASTER FOCUSED AT AVERAGE BRIGHTNESS RASTER SIZE = $18" \times 13\frac{1}{2}"$	GRID-DRIVE SERVICE $E_f = 6.3$ VOLTS ULTOR VOLTS = 16000 GRID $N\#1$ BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF RASTER FOCUSED AT AVERAGE BRIGHTNESS RASTER SIZE = $18" \times 13\frac{1}{2}"$
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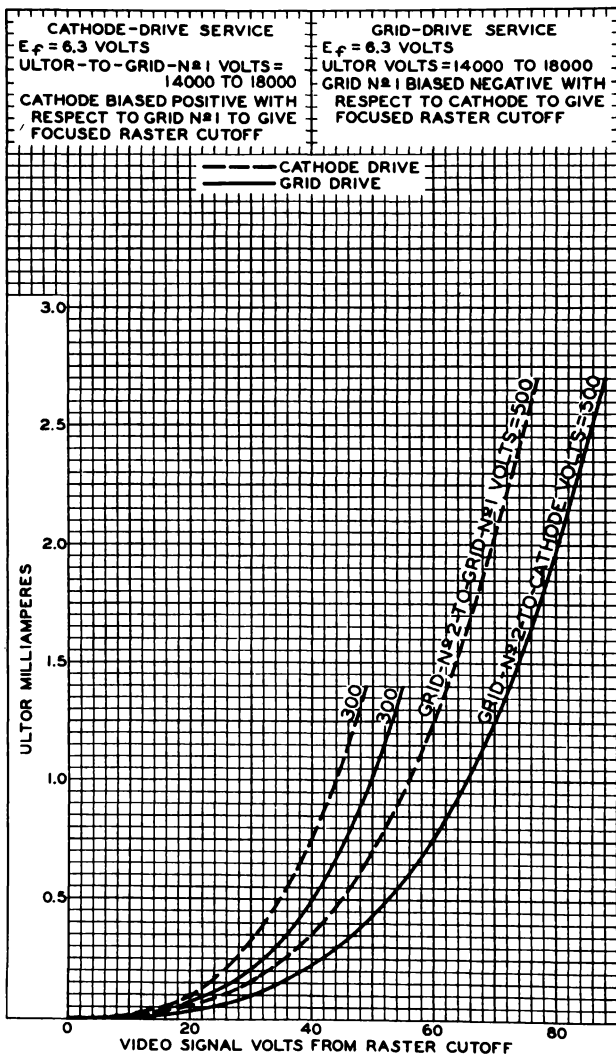


21ALP4-A



21ALP4-A

AVERAGE DRIVE CHARACTERISTICS



MAY 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8625



21ALP4-B

KINESCOPE

RECTANGULAR GLASS TYPE

ALUMINIZED SCREEN

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

21ALP4-B

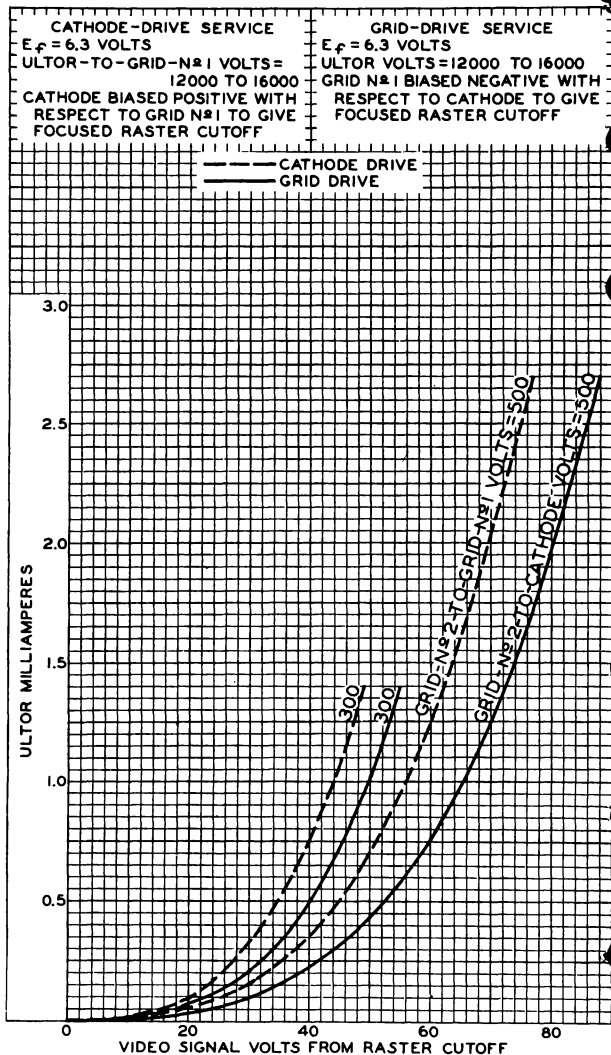
The 21ALP4-B is the same as the 21ALP4-A except that it has a *maximum ultor voltage rating* of 20000 volts and has ULTOR CURRENT vs DRIVE curves as shown on the back of this sheet.

21ALP4-B



21ALP4-B

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8905



21AMP4-A KINESCOPE

21AMP4-A

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf
Cathode to all other electrodes. 5 μf
External conductive coating to ultor* $\begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 75%

Phosphor (For curves, see front of this section). . P4—Sulfide Type

Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $20" \pm \frac{3}{8}"$

Greatest width $20\text{--}1\frac{1}{4}" \pm \frac{1}{8}"$

Greatest height. $16\text{--}3\frac{3}{8}" \pm \frac{1}{8}"$

Diagonal $21\text{--}3\frac{3}{8}" \pm \frac{1}{8}"$

Screen Dimensions (Minimum):

Greatest width $19\text{--}1\frac{1}{8}"$

Greatest height. 15"

Diagonal $20\text{--}1\frac{1}{4}"$

Projected area 255 sq. in.

Weight (Approx.) 24 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No. J1-21)

Bulb J171 (90°)

Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

Basing Designation for BOTTOM VIEW 12N

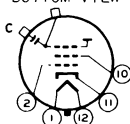
Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor

(Grid No.3,
Collector)

C - External
Conductive
Coating

* The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21AMP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21AMP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

21AMP4-A



21AMP4-A KINESCOPE

GRID-DRIVE^A SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period. . . .	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

<i>With any ultor voltage (E_{c2k}) between 14000* and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts</i>		
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC)°.	$\left[\sqrt{\frac{E_{c3k}}{16000}} \times 108 \right] \pm 20\%$	ma
Ion-Trap Magnet Current	$\sqrt{\frac{E_{c3k}}{16000}} \times 30$	ma
(Average)**	$\sqrt{\frac{E_{c3k}}{16000}} \times 33$	gausses
Minimum Field Strength of		
PM Ion-Trap Magnets . . .		
Field Strength of Adjustable	0 to 8	gausses
Centering Magnet.		

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	16000	18000	volts
<i>and grid-No.2 voltage of</i>	300	400	volts
Grid-No.1 Voltage for			
Visual Extinction of			
Focused Raster.	-28 to -72	-37 to -96	volts

^A Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

* , ° , ** , § : See next page.

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TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21AMP4-A KINESCOPE

21AMP4-A

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Focusing-Coil Current (DC) . .	108 $\pm$ 20%	115 $\pm$ 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

CATHODE-DRIVE[■] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode . .	180 max.	volts

Equipment Design Ranges:

*With any ultor-to-grid-No.1 voltage (E_{c2g1}) between
14000* and 18000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between
220 and 620 volts*

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of E_{c2g1}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of E_{c2g1}	volts

■ cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

0, **, §: see next page.

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TUBE DIVISION

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21AMP4-A



21AMP4-A KINESCOPE

Grid-No.2 Current	-15 to +15	μamp
Focusing-Coil Current (DC) ^o .	$\left[\sqrt{\frac{E_{c391}}{16000}} \times 108 \right] \pm 20\%$	ma
Ion-Trap Magnet Current (Average) ^{**}	$\sqrt{\frac{E_{c391}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c391}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-No.1</i>			
	<i>voltage of</i>	16000	18000 volts
<i>and grid-No.2-to-grid-No.1</i>			
	<i>voltage of</i>	300	400 volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value			
(Peak negative)	25 to 58	34 to 78	volts
Focusing-Coil Current (DC)	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
---------------------------------------	----------	---------

^o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (See *Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 19-1/8" x 15" picture size.

^{**} For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

[§] For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



21AMP4-A KINESCOPE

21AMP4-A

DIMENSIONAL OUTLINE

for Type 21AMP4-A is the same as that shown for Type 21ALP4-A, except that the 21AMP4-A has a Small-Shell Duodecal 5-Pin Base

CURVES

for Type 21AMP4-A are the same as those shown for Type 21ALP4-A



21AP4

KINESCOPE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

21AP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 6 μf Cathode to All Other Electrodes. 5 μf

Faceplate (With about 66% light transmission) Frosted Filterglass

Phosphor (For Curves, see front of this Section). No.4—Sulfide Type

Fluorescence and Phosphorescence White

Persistence of Phosphorescence Short

Focusing Method. Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Maximum Overall Length 22-5/16"

Greatest Diagonal of Tube at Lip 20-3/4" $\pm$ 1/4"Greatest Width of Tube at Lip. 19-23/32" $\pm$ 1/8"Greatest Height of Tube at Lip 15-5/16" $\pm$ 1/8"

Screen Size. 18-3/8" x 13-15/16"

Mounting Position. Any

Ultor® Terminal. Metal-Shell Lip

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

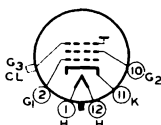
BOTTOM VIEW

Pin 1—Heater

Pin 2—Grid No.1

Pin 10—Grid No.2

Pin 11—Cathode



Pin 12—Heater

Metal—Shell Lip—

Grid No.3,

Collector

Maximum Ratings, Design-Center Values:

ULTOR® VOLTAGE 18000 max. volts

GRID-No.2 VOLTAGE. 500 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

- In the 21AP4, grid No.3, which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

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TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21AP4



21AP4

KINESCOPE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode. . 180 max. volts

Typical Operation:

Ultor Voltage* 14000 16000 volts

Grid-No.2 Voltage. 300 300 volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot -33 to -77 -33 to -77 volts

Focusing-Coil Current (DC)^{oo} . 104 ± 6% 110 ± 6% ma

Field Strength of Single-

Field Ion-Trap Magnet . . . 45 50 gauss

Ion-Trap Magnet Current

(DC, approx.)#. 90 - ma

Field Strength of Adjustable

Centering Magnet. . . . 0 to 8 0 to 8 gauss

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

^{oo} For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 18-3/8" x 13-15/16" picture area sharply focused at center of screen.

For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.111 located in optimum position and rotated to give maximum brightness.



21AP4

KINESCOPE

21AP4

OPERATING NOTES

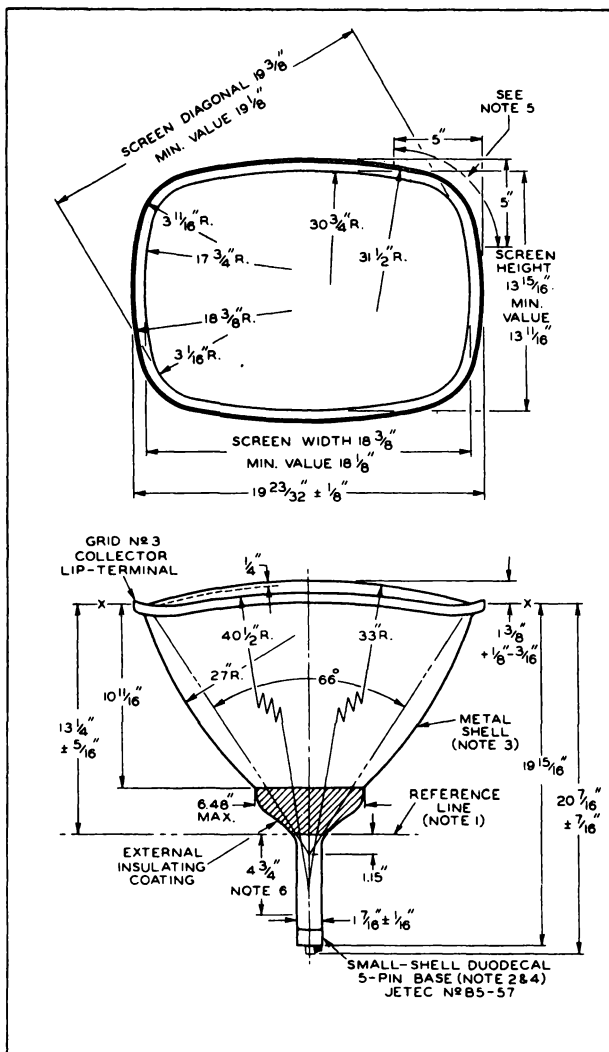
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 21AP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 19.8 kilovolts (absolute value), shielding of the 21AP4 for x-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Direction of the field of the ion-trap magnet should be such that the north pole is adjacent to vacant pin position No.8 and the south pole to pin No.2.

21AP4



21AP4 KINESCOPE



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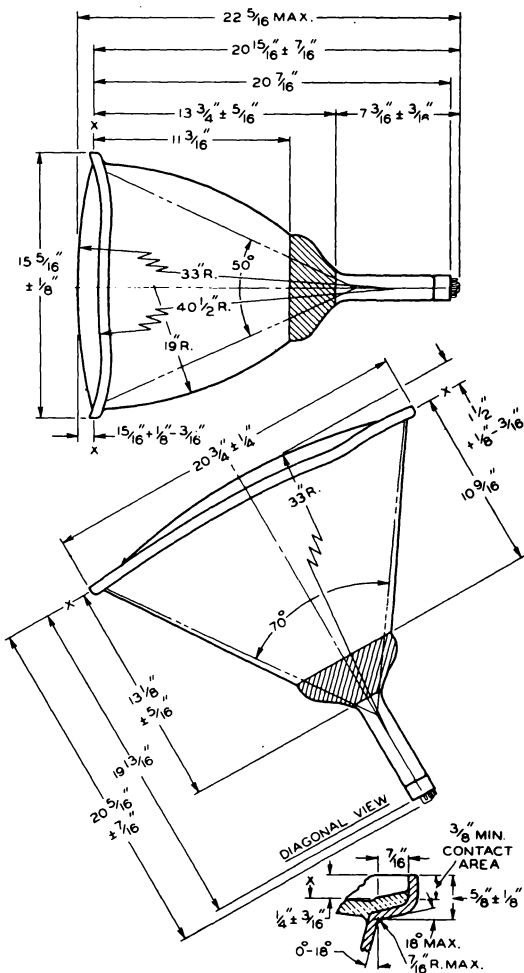
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7649A



21AP4 KINESCOPE

21AP4



92CL-7649

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7649B

21AP4



21AP4

KINESCOPE

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING A DIAMETER OF 3-1/4".

NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.

NOTE 5: SUPPORT TUBE IN LIP REGION ONLY AT CORNERS WITHIN THIS SPACE.

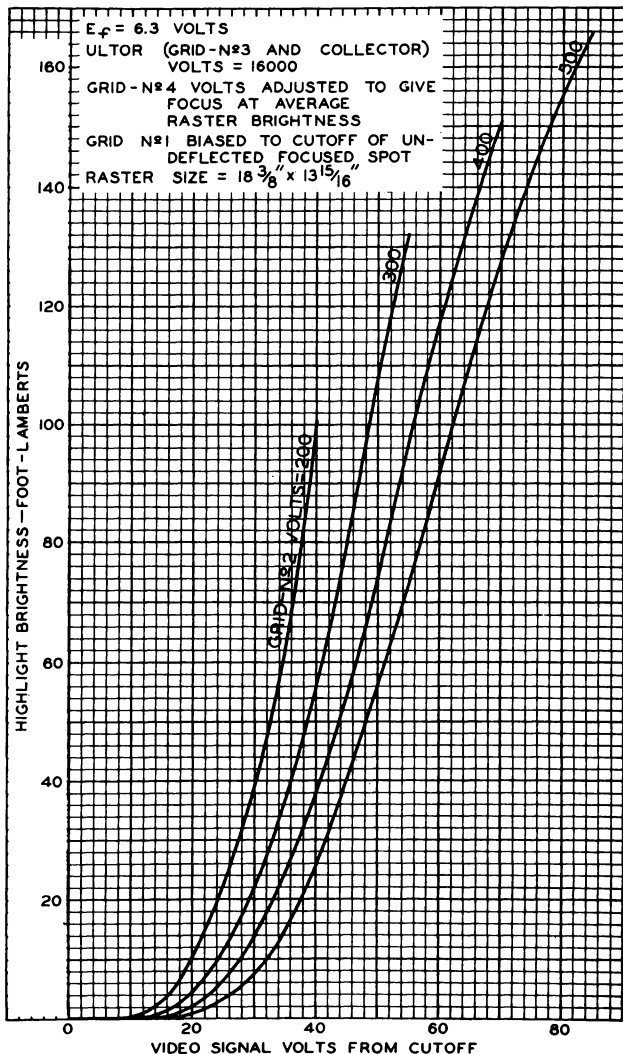
NOTE 6: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.



21AP4

21AP4

AVERAGE GRID-DRIVE CHARACTERISTICS

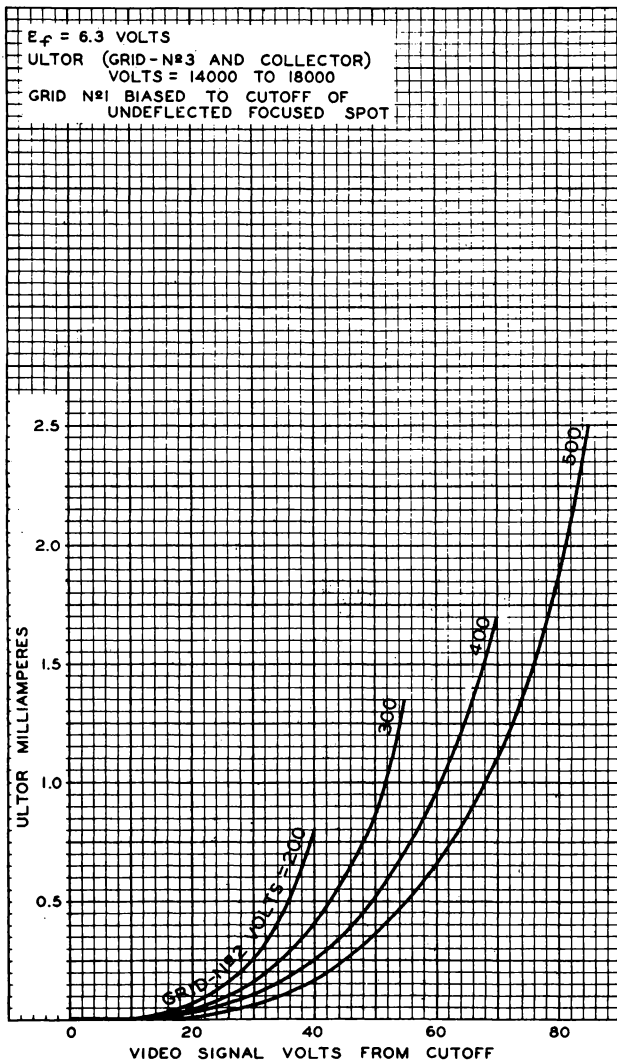


21AP4



21AP4

AVERAGE GRID-DRIVE CHARACTERISTICS



MAY 11, 1951

TUBE DEPARTMENT

92CM - 7652

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21ATP4 KINESCOPE

21ATP4

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 21ATP4 is the same as the 21ALP4-A except for the following items:

Direct Interelectrode Capacitances:

External conductive coating to ultor . .	{ 1500 max.	$\mu\mu\text{f}$
	{ 1200 min.	$\mu\mu\text{f}$



21AVP4

21AVP4/21AUP4 KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf
Cathode to all other electrodes 5 μf
External conductive coating to ultor $\begin{cases} 1500 \text{ max.} \\ 1200 \text{ min.} \end{cases}$ μf

Faceplate, Spherical. Filterglass

Light transmission (Approx.). 71%

Phosphor (For curves, see front of this section). P4—Sulfide Type

Fluorescence. White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal. 72°

Horizontal. 67°

Vertical. 53°

Ion-Trap Gun. Requires External Single-Field Magnet

Tube Dimensions:

Overall length. $23\text{--}1/32" \pm 3/8"$

Greatest width. $20\text{--}1/4" \pm 1/8"$

Greatest height. $16\text{--}3/8" \pm 1/8"$

Diagonal. $21\text{--}3/8" \pm 1/8"$

Screen Dimensions (Minimum):

Greatest width. $19\text{--}1/8"$

Greatest height. 15"

Diagonal. $20\text{--}1/4"$

Projected area. 255 sq. in.

Weight (Approx.). 24 lbs

Mounting Position Any

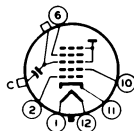
Cap Recessed Small Cavity (JETEC No. J1-21)

Bulb. J171 (72°)

Base. Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor
(Grid No.3,
Grid No.5,
Collector)
C - External
Conductive
Coating

*: See next page.

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TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21AVP4



21AVP4

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR [•] VOLTAGE	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value [*]	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 14000* and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from		
Raster Cutoff (Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.4 Current	-25 to +25	μ amp
Grid-No.2 Current	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average) ^{**}	$\sqrt{\frac{E_{c5k}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c5k}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

[•], ^{*}, [#], ^{**}, [§]: See next page.

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TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21AVP4

21AVP4

KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	16000	18000	volts
and grid-No.2 voltage of	300	400	volts

Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp . . .	-65 to +350	-75 to +400	volts

Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-37 to -96	volts
--	------------	------------	-------

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts

Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses
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Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
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CATHODE-DRIVE[■] SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Design-Center Values:

ULTOR [•] -TO-GRID-No.1 VOLTAGE	18000 max.	volts
--	------------	-------

GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value.	1000 max.	volts
Negative value*	500 max.	volts

GRID-No.2-TO-GRID-No.1 VOLTAGE.	625 max.	volts
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GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
---------------------------------------	----------	-------

CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period. . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

• The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21AVP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 21AVP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

*, **, §: See next page.

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TUBE DIVISION

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21AVP4



21AVP4

KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between
14000# and 18000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between
220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp 0% to 2.6% of E_{c5g1} volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 8.5% to 19.4% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 8.5% to 19.4% of E_{c2g1} volts

Grid-No.4 Current

-25 to +25

 μ amp

Grid-No.2 Current

-15 to +15

 μ amp

Ion-Trap Magnet Current

(Average)**

$$\sqrt{\frac{E_{c5g1}}{16000}} \times 30 \quad \text{ma}$$

Minimum Field Strength of

PM Ion-Trap Magnet§

$$\sqrt{\frac{E_{c5g1}}{16000}} \times 33 \quad \text{gausses}$$

Field Strength of Adjustable

Centering Magnet.

0 to 8 gaussess

Examples of Use of Design Ranges:

With ultor-to-grid-No.1

voltage of

16000

18000

volts

and grid-No.2-to-grid-No.1

voltage of

300

400

volts

Grid-No.4-to Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp 0 to 415 0 to 470 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 25 to 58 34 to 78 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 25 to 58 34 to 78 volts

Minimum Field Strength of

PM Ion-Trap Magnet.

33

35

gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

#, **, §: See next page.

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TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21AVP4

KINESCOPE

21AVP4

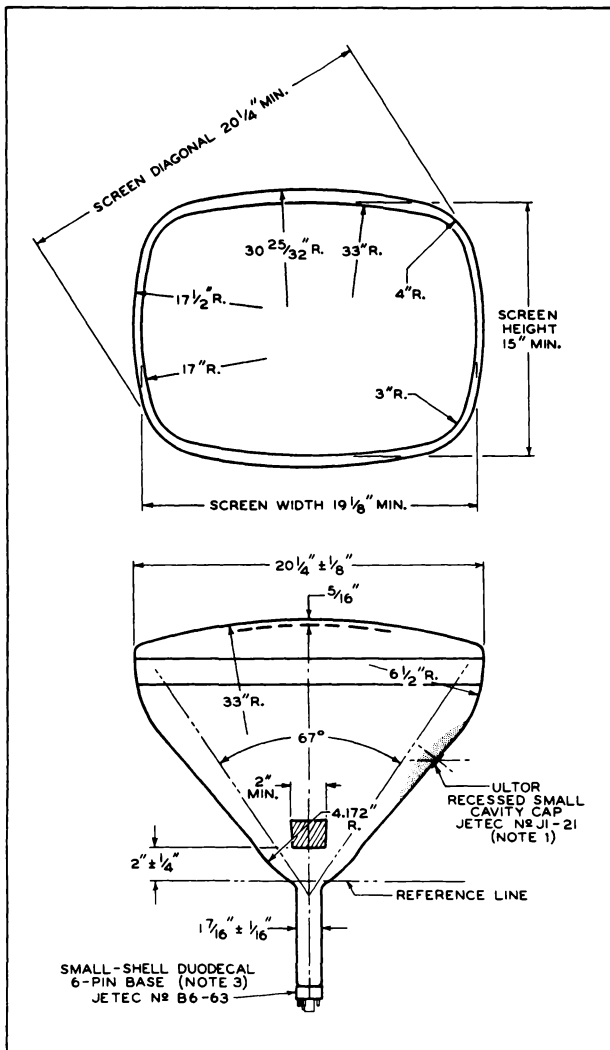
- # Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 14000 volts.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussess. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

21AVP4



21AVP4 KINESCOPE



NOV. 1, 1955

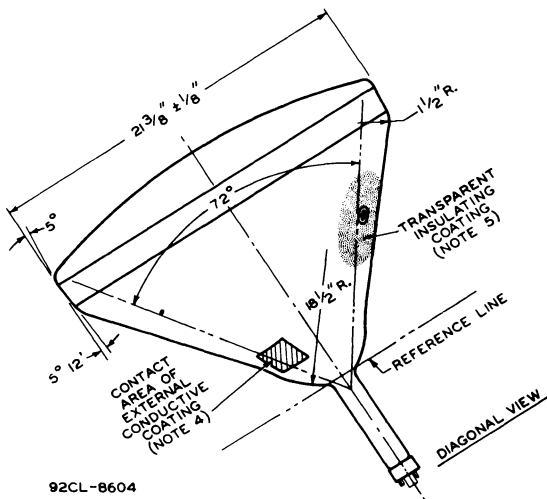
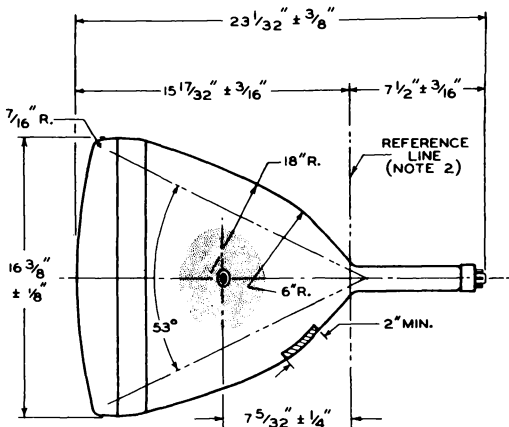
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8604A



21AVP4 KINESCOPE

21AVP4



92CL-8604

NOV. 1, 1955

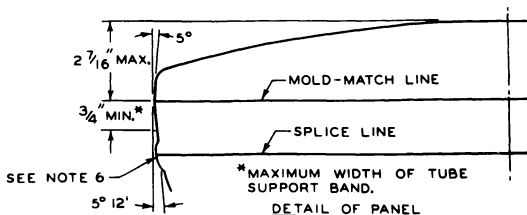
TUBE DIVISION
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CE-8604B

21AVP4



21AVP4 KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUND.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

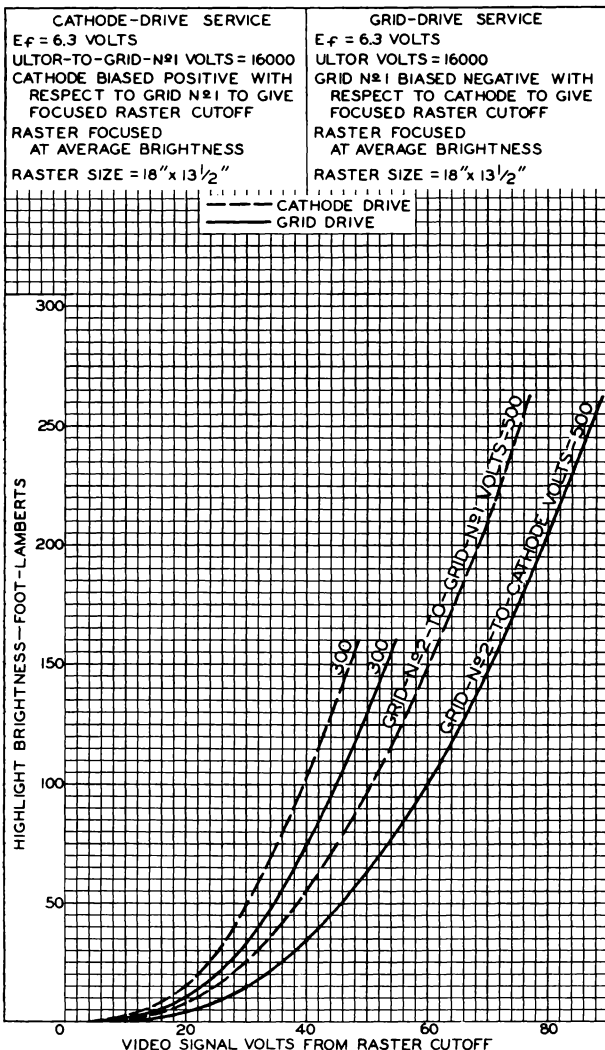
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16$ " BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



21AVP4

21AVP4

AVERAGE DRIVE CHARACTERISTICS

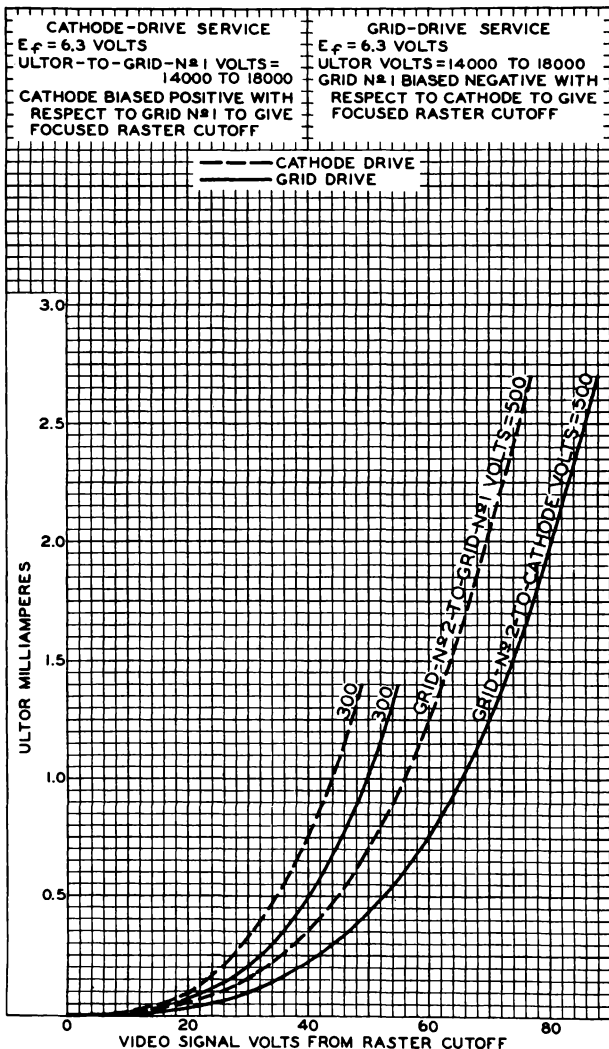


21AVP4



21AVP4

AVERAGE DRIVE CHARACTERISTICS



NOV. 2, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8839



21AVP4-A

21AVP4-A/21AUP4-A

KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 21AVP4-A/21AUP4-A is the same as the 21AVP4/21AUP4 except for the following item:

Phosphor (For curves, see front of this section) . . P4—Sulfide Type
Aluminized

CURVES

for Type 21AVP4-A/21AUP4-A are the same as those
shown for Type 21ALP4-A



21AWP4 KINESCOPE

21AWP4

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current 0.6 $\pm$ 10% amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 $\mu\mu\text{f}$
Cathode to all other electrodes 5 $\mu\mu\text{f}$
External conductive coating to ultor* $\left\{ \begin{array}{l} 1500 \text{ max.} \\ 1200 \text{ min.} \end{array} \right. \mu\mu\text{f}$

Faceplate, Spherical. Filterglass

Light transmission (Approx.). 71%

Phosphor (For curves, see front of this section). .P4—Sulfide Type

Aluminized

Fluorescence. White

Phosphorescence White

Persistence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal. 72°

Horizontal. 67°

Vertical. 53°

Ion-Trap Gun. Requires External Single-Field Magnet

Tube Dimensions:

Overall length. 23-1/32" $\pm$ 3/8"

Greatest width. 20-1/4" $\pm$ 1/8"

Greatest height 16-3/8" $\pm$ 1/8"

Diagonal. 21-3/8" $\pm$ 1/8"

Screen Dimensions (Minimum):

Greatest width 19-1/8"

Greatest height 15"

Diagonal. 20-1/4"

Projected area 255 sq. in.

Weight (Approx.) 24 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No. J1-21)

Bulb J171 (72°)

Base Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

Basing Designation for BOTTOM VIEW 12N

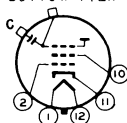
Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor
(Grid No.3,
Collector)
C - External
Conductive
Coating

* The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21AWP4, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21AWP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.



21AWP4 KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	18000 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds. . .	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3k}) between 14000 and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.2 Current.	-15 to +15	μ amp
Focusing-Coil Current (DC) ^o .	$\left[\sqrt{\frac{E_{c3k}}{16000}} \times 108 \right] \pm 20\%$	ma
Ion-Trap Magnet Current		
(Average) ^{**}	$\sqrt{\frac{E_{c3k}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c3k}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	16000	18000	volts
and grid-No.2 voltage of	300	400	volts
Grid-No.1 Voltage for			
Visual Extinction of			
Focused Raster	-28 to -72	-37 to -96	volts

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

*,^o,^{**},[§]: see next page.



2IAWP4

KINESCOPE

2IAWP4

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Focusing-Coil Current (DC) . .	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
---------------------------------------	----------	---------

CATHODE-DRIVE[■] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE.	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period. 180 max. volts

Heater positive with respect to cathode . 180 max. volts

Equipment Design Ranges:

*With any ultor-to-grid-No.1 voltage (E_{c3g1}) between
14000* and 18000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between
220 and 620 volts*

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 8.5% to 19.4% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 8.5% to 19.4% of E_{c2g1} volts

[■] Cathode drive is the operating condition in which the video signal
varies the cathode potential with respect to grid No.1 and the other
electrodes.

* Brilliance and definition decrease with decreasing ultor voltage or
ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-
to-grid-No.1 voltage should not be less than 14000 volts.

O, **, §: See next page.

NOV. 1, 1955

TUBE DIVISION

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21AWP4 KINESCOPE

Grid-No.2 Current	-15 to +15	μamp
Focusing-Coil Current (DC) ^o	$\left[\sqrt{\frac{E_{c3g1}}{16000}} \times 108 \right] \pm 20\%$	ma
Ion-Trap Magnet Current (Average) ^{**}	$\sqrt{\frac{E_{c3g1}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c3g1}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1

voltage of 16000 18000 volts

and grid-No.2-to-grid-No.1

voltage of 300 400 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster. 25 to 58 34 to 78 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 25 to 58 34 to 78 volts

Focusing-Coil Current (DC). 108 ± 20% 115 ± 20% ma

Minimum Field Strength of

PM Ion-Trap Magnet. 33 35 gaussess

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. 1.5 max. megohms

^o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (*See Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 19-1/8" x 15" picture size.

^{**} For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

[§] For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gaussess. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



21AWP4 KINESCOPE

21AWP4

DIMENSIONAL OUTLINE

for Type 21AWP4 is the same as that shown for Type 21AVP4/21AUP4, except that the 21AWP4 has a Small-Shell Duodecal 5-Pin Base

CURVES

for Type 21AWP4 are the same as those shown for Type 21ALP4-A



21AXP22

21AXP22

COLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE
MAGNETIC CONVERGENCE

ELECTROSTATIC FOCUS
MAGNETIC DEFLECTION

DATA

General:

Electron Guns, Three with Axes Tilted
 Toward Tube Axis Blue, Green, Red

Heater, for Unipotential Cathode of
 Each Gun, Paralleled with Each of
 the Other Two Heaters within Tube:

Voltage. 6.3 ac or dc volts
 Current. 1.8 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 of any gun to all other
 electrodes except the No.1 grids
 of the other two guns. 7 $\mu\mu\text{f}$

Cathode of blue gun + cathode of green
 gun + cathode of red gun to all
 other electrodes 16 $\mu\mu\text{f}$

Grid No.3 (Of each gun tied within
 tube to No.3 grids of other two
 guns) to all other electrodes. 9 $\mu\mu\text{f}$

Faceplate, Spherical Filterglass
 Light transmission (Approx.) 77%

Screen, on Inner Surface of Faceplate:

Type Metal-Backed, Tricolor, Phosphor-Dot
 Phosphor (Three separate phosphors, collectively). P22
 Fluorescence and phosphorescence of
 separate phosphors, respectively. Blue, Green, Red
 Persistence of group phosphorescence Medium
 Dot arrangement. Triangular group consisting of
 blue dot, green dot, and red dot

Spacing between centers of adjacent dot trios (Approx.) 0.029"

Size (Minimum):

Greatest width 19-1/16"
 Height 15-1/4"
 Projected area 255 sq. in.

Focusing Method. Electrostatic
 Convergence Method Magnetic
 Deflection Method. Magnetic

Deflection Angles (Approx.):

Horizontal 70°
 Vertical 55°

Tube Dimensions:

Maximum overall length 25-5/16"

Diameter:

At lip 20-9/16" $\pm$ 1/8"
 At flange. 21-1/4" max.

Weight (Approx.) 28 lbs

Mounting Position. Any

Ultor[•] Terminal. Metal-Shell Lip
 Base Small-Shell Neodiheptal 12-Pin (JETEC No.B12-131)

[•]: See next page.

21AXP22



21AXP22

COLOR KINESCOPE

Socket Alden Nos. 214NMNISC (Radial leads),
214NMINC (Axial leads), or equivalent

Basing Designation for BOTTOM VIEW 14W

Pin 1—Heater

Pin 2—Grid No.1

of Red Gun

Pin 3—Grid No.2

of Red Gun

Pin 4—Cathode

of Red Gun

Pin 5—Cathode

of Green Gun

Pin 6—Grid No.1

of Green Gun

Pin 7—Grid No.2

of Green Gun

Pin 9—Grids No.3

Pin 11—Grid No.2

of Blue Gun

Pin 12—Grid No.1

of Blue Gun

Pin 13—Cathode

of Blue Gun

Pin 14—Heater

METAL-SHELL LIP:

Ultror

(Grid No.4,

Grid No.5,

Collector)



Maximum Ratings, Design-Center Values:

ULTOR*—TO—CATHODE (Of each gun) VOLTAGE. 25000 max. volts

ULTOR CURRENT, (Average, each gun) 500* max. μ amp

GRID—No.3—TO—CATHODE (Of each gun) VOLTAGE 6000 max. volts

GRID—No.2—TO—CATHODE VOLTAGE (Each gun). 800 max. volts

GRID—No.1—TO—CATHODE VOLTAGE (Each gun):

Negative bias value. 400 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER—CATHODE VOLTAGE (Each gun):

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode. 180 max. volts

Equipment Design Ranges:

For ultor voltage (E_{c4} each gun) of 25000 volts

Grid—No.3 (Focusing
electrode)—to—Cathode

(Of each gun) Voltage. 15.2% to 21.2% of E_{c4} each gun volts

Grid—No.2—to—Cathode
Voltage (Each gun)

when circuit design

utilizes grid—No.1—

to—cathode voltage

(E_{c1k}) at fixed

value for raster

cutoff See Cutoff Design Chart

* A value of average ultor current per gun higher than 500 microamperes will increase picture brightness but may impair resolution and shorten cathode life.

• See next page.

MAR. 1, 1955

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21AXP22

21AXP22

COLOR KINESCOPE

Grid-No.1-to-Cathode Volt-
age (Each gun) for Visual
Extinction of Focused
Raster when circuit de-
sign utilizes grid-No.2-
to-cathode voltage
(E_{c2k}) at fixed value See Cutoff Design Chart

Variation in Raster

Cutoff Between Guns

in Any Tube. $\pm 21\%$ of average of highest
and lowest cutoff values

Grid-No.3 Current for ultor

current of 800 μ amp. -45 to +75 μ amp

Grid-No.2 Current (Each gun) . . .

-5 to +5 μ amp

Percentage of Total Ultor Current
Supplied by Each Gun:

To produce Illuminant-C White
(I.C.I. Coordinates
 $x = 0.310$, $y = 0.316$):

Red gun 47 to 67 per cent

Blue gun 11 to 24 per cent

Green gun 20 to 33 per cent

To produce White of 8500°K +
27M.P.C.D. (I.C.I. Coordin-
ates $x = 0.287$, $y = 0.316$):

Red gun 42 to 60 per cent

Blue gun 12 to 27 per cent

Green gun 23 to 38 per cent

Maximum Raster Shift in Any

Direction from Screen Center[□]. 1 inch

Maximum Compensation to be Pro-

vided by the Following Components:

Purifying coil or magnet Raster shift of 1" in any di-
rection from screen center

Converging component (Each gun):

For static convergence—

After adjustment has been
made for optimum color
purity and dynamic
convergence

Shift of spot by $\pm 5/8$ "

• The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21AXP22, the ultor function is performed by grid No.4. Since grid No.4, grid No.5, and collector are connected together within the 21AXP22, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

□ Centering of the raster on the screen is accomplished by passing direct current of the required value through each pair of deflecting coils to compensate for raster shift resulting from adjustments for optimum convergence and color purity.

21AXP22



21AXP22 COLOR KINESCOPE

For dynamic convergence†—

Effected by mmf of approximately parabolic waveshape synchronized with scanning

Horizontal:

Red spot and green spot Shift of 1/4"
Blue spot Shift of 1/2"

Vertical:

Red spot and green spot Shift of 3/8"
Blue spot Shift of 1/8"

Blue-positioning magnet (Blue gun):

After adjustment has been made for color purity and dynamic convergence Shift of blue spot by $\pm 1/2$ "

Examples of Use of Design Ranges:

For ultor voltage of 25000 volts

Grid-No.3 (Focusing electrode)—to-Cathode (Of each gun)

Voltage 3800 to 5300 volts

Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage of -70 volts for raster cutoff

130 to 370 volts

Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage of 200 volts. . . .

-45 to -100 volts

Limiting Circuit Values:

High-Voltage Circuits:

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the *ultor power supply* and the *grid-No.3 power supply* be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50 milliamperes. In addition, to prevent cathode damage with resultant decrease in tube life, the effective resistance between the ultor power supply output capacitor and the ultor, and the effective resistance between grid-No.3 power supply output capacitor and the grid-No.3 electrode should not be less than 50000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their

† Indicated values apply when RCA test yoke is used with the 21AXP22.



21AXP22

21AXP22

COLOR KINESCOPE

respective circuits. It is to be noted that the effectiveness of the resistance between the ultor power supply output capacitor and the ultor may be impaired if capacitance in excess of 750 μf is introduced between the kinescope and ground by the mounting arrangement of the kinescope.

In equipment utilizing a well-regulated ultor power supply, the *grid-No.3-circuit resistance* should be limited to 7.5 megohms.

Low-Voltage Circuits:

Grid-No.1-Circuit Resistance (Each gun). . 1.5 max. megohms

When the cathode of each gun is not connected directly to its associated heater, the grid-No.2-to-heater circuit, the grid-No.1-to-heater circuit, and the cathode-to-heater circuit, should each have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

When the cathode is connected directly to the heater, the grid-No.2-to-heater circuit, and the grid-No.1-to-heater circuit should have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

X-RAY WARNING

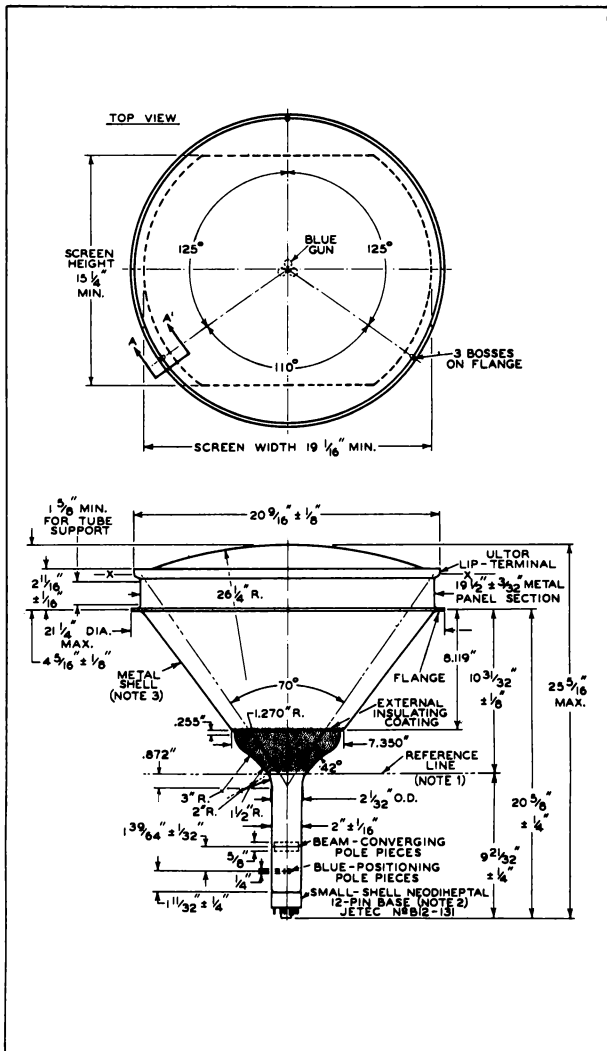
X-ray radiation is produced by the 21AXP22 when it is operated at its normal ultor voltage. The radiation is through the faceplate, and is sufficient to require the adoption of safety measures in TV receivers. Shielding such as that provided by a 1/4-inch thickness of safety glass (lime) in front of the faceplate, should prove adequate to provide protection against personal injury from prolonged exposure at close range when the tube is operated at its maximum ultor voltage rating.

When this tube is being serviced outside of the TV receiver cabinet, it should never be operated without providing adequate X-ray shielding in front of faceplate. Because the ultor voltage may rise above its maximum rated value for short periods during adjustment with increase in the amount of X-ray radiation, provision should be made for placing a 3/8-inch thickness of safety glass in front of the faceplate to avoid the hazard of X-ray radiation.

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21AXP22 COLOR KINESCOPE



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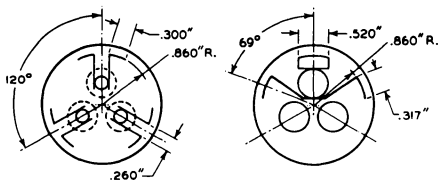
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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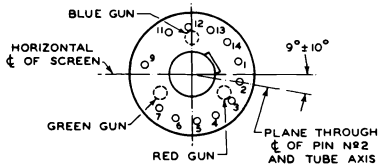
21AXP22 COLOR KINESCOPE

21AXP22

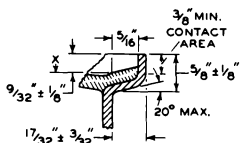


LOCATION OF BEAM-
CONVERGING POLE PIECES

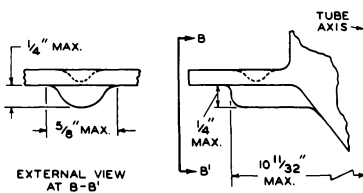
LOCATION OF BLUE-
POSITIONING POLE PIECES



BASE
BOTTOM VIEW



DETAIL OF LIP



EXTERNAL VIEW
AT B-B'

EXTERNAL VIEW AT A-A'
DETAIL OF FLANGE BOSSES

92CL-8399R3

21AXP22



21AXP22 COLOR KINESCOPE

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE $2.465" \pm 0.001"$ I.D. CONCENTRIC WITH NECK AXIS, WILL REST ON ENVELOPE FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING A DIAMETER OF 3".

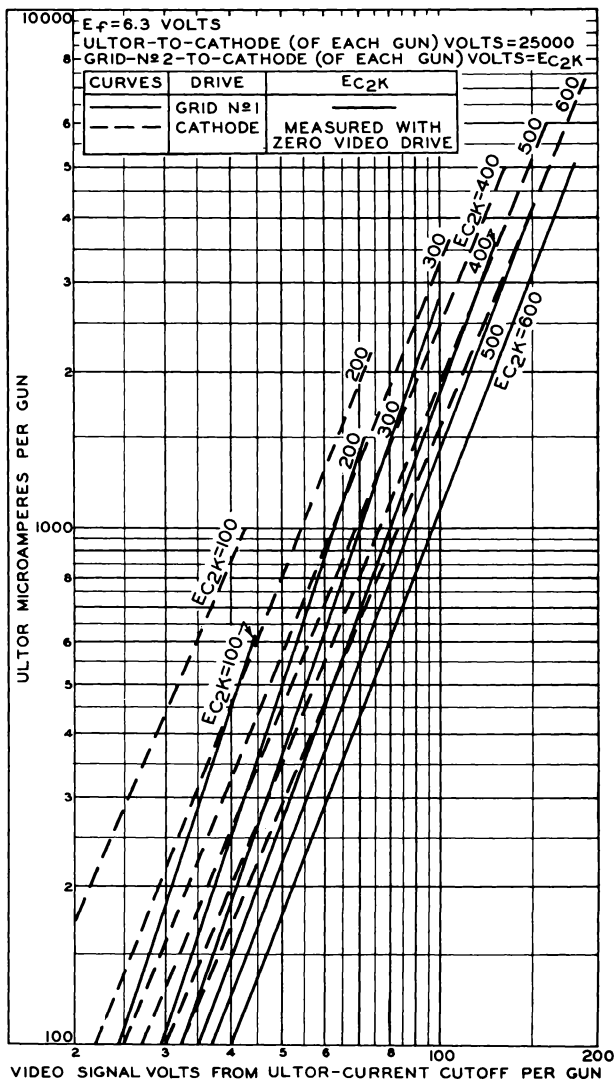
NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.



21AXP22

21AXP22

TYPICAL DRIVE CHARACTERISTICS



MAR. 18, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8566

21AXP22



21AXP22

TYPICAL LIGHT-OUTPUT CHARACTERISTIC

 $E_f = 6.3$ VOLTS

ULTOR-TO-CATHODE (OF EACH GUN) VOLTS = 25000

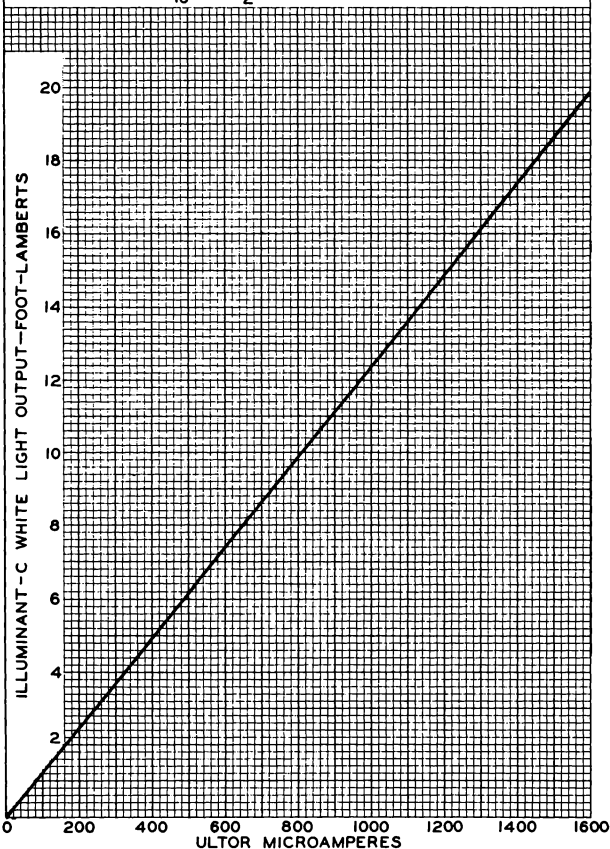
GRID-N₂₃-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS

DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR
CURRENT TO PRODUCE ILLUMINANT-C WHITE LIGHT OUTPUT
PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH
GUN TO PRODUCE ILLUMINANT-C WHITE:

RED GUN: 57%

BLUE GUN: 17%

GREEN GUN: 26%

RASTER SIZE = $19\frac{1}{16}$ " x $14\frac{1}{2}$ "

MAR. 18, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

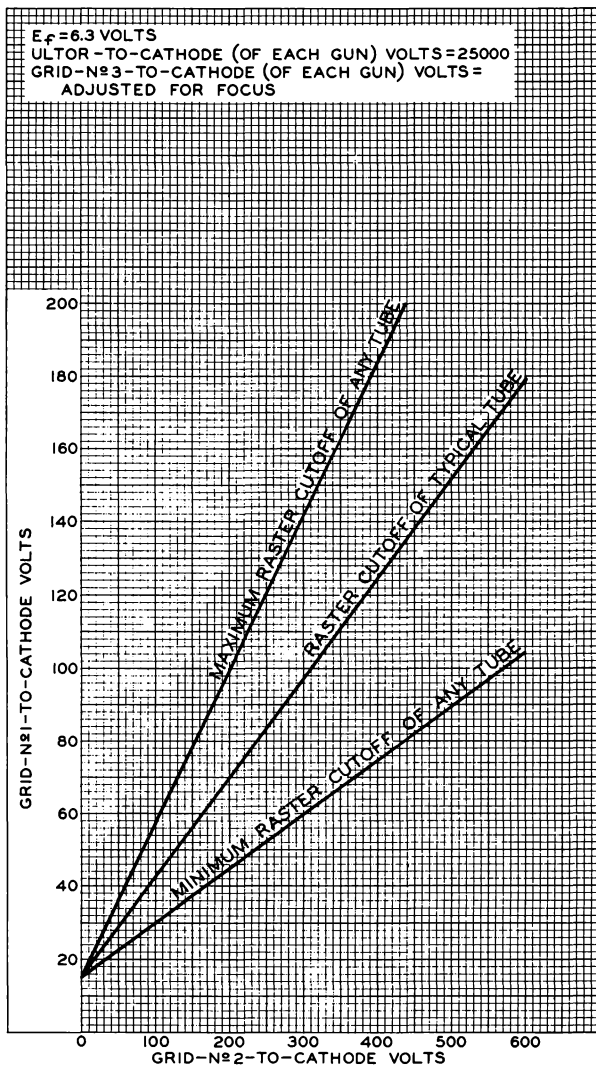
92CM-8426R2



2IAXP22

2IAXP22

CUTOFF DESIGN CHART



MAR. 18, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8565



21CXP4

21CXP4 PICTURE TUBE

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION
LOW GRID—No. 2 VOLTAGE CATHODE-DRIVE TYPE

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp
Warm-up time (Average) 11 sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:

Grid No. 1 to all other electrodes 6 μf
Cathode to all other electrodes 5 μf
External conductive coating to ultor $\begin{cases} 2500 \text{ max. } \mu\text{f} \\ 2000 \text{ min. } \mu\text{f} \end{cases}$

Faceplate, Spherical Filterglass

Light transmission (Approx.) 74%

Phosphor (For curves, see front of this section) . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68°

Electron Gun Type Requiring No Ion-Trap Magnet

Tube Dimensions:

Overall length $18" \pm 3/8"$

Greatest width $20-1/4" \pm 1/8"$

Greatest height $16-3/8" \pm 1/8"$

Diagonal $21-3/8" \pm 1/8"$

Neck length $5-1/2" \pm 3/16"$

Radius of curvature of faceplate (External surface) . . $33"$

Screen Dimensions (Minimum):

Greatest width $19-1/16"$

Greatest height $15-1/16"$

Diagonal $20-1/4"$

Projected area 262 sq. in.

Weight (Approx.) 24 lbs

Operating Position Any

Cap. Recessed Small Cavity (JEDEC No. J1-21)

Bulb J171D2/E1

Base Small-Shell Duodecal 6-Pin, Arrangement 1
(JEDEC Group 4, No. B6-63), or
Short Small-Shell Duodecal 6-Pin
(JEDEC Group 4, No. B6-203)

21CXP4

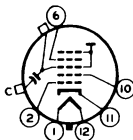


21CXP4

PICTURE TUBE

Basing Designation for BOTTOM VIEW12L

Pin 1-Heater
Pin 2-Grid No.1
Pin 6-Grid No.4
Pin 10-Grid No.2
Pin 11-Cathode
Pin 12-Heater



Cap-Ultor
(Grid No.3,
Grid No.5,
Collector)
C-External
Conductive
Coating

CATHODE-DRIVE[®] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE {20000 max. volts
12000[•] min. volts

GRID-No.4-TO-GRID-No.1 VOLTAGE:

Positive value 1000 max. volts
Negative value 500 max. volts

GRID-No.2-TO-GRID-No.1 VOLTAGE 64 max. volts

CATHODE-TO-GRID-No.1 VOLTAGE:

Positive-peak value. 200 max. volts
Positive-bias value. 140 max. volts
Negative-bias value. 0 max. volts
Negative-peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect
to cathode:

During equipment warm-up period

not exceeding 15 seconds 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect

to cathode 180 max. volts

Equipment Design Ranges:

*With any ultor-to-grid-No.1 voltage (E_{c5g1}) between
12000 and 20000 volts and grid-No.2-to-grid-No.1
voltage (E_{c2g1}) between 40 and 64 volts*

Grid-No.4-to-Grid-No.1

Voltage for focus⁹ 0 to 350 volts

Cathode-to-Grid-No.1 Voltage

(E_{kg1}) for visual extinction

of focused raster[▲] See Raster-Cutoff-Range Chart

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff (Black Level):

White-level value

(Peak negative). Same value as determined for
 E_{kg1} except video drive is a
negative voltage

■, ♦, §, ▲: See next page.



21CXP4

21CXP4

PICTURE TUBE

Grid-No.4 Current.	-25 to +25	μ a
Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

Examples of Use of Design Ranges:*With ultor-to-grid-**No.1 voltage of 18000 volts**and grid-No.2-to-grid-**No.1 voltage of 50 volts*

Grid-No.4-to-Grid-No.1 Voltage

for focus. 0 to 350 volts

Cathode-to-Grid-No.1 Voltage

for visual extinction
of focused raster. 32 to 47 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff (Black Level):

White-level value. -32 to -47 volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

□ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

• This value is a working design-center minimum. The equivalent absolute minimum ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21CXP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-to-grid-No.1 voltage is never less than 11,000 volts.

§ The grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor-to-grid-No.1 voltage or grid-No.2-to-grid-No.1 voltage within design ranges shown for these items.

▲ The cathode-to-grid-No.1 voltage (E_{kg1}) will increase by approximately 2 per cent for every 1000-volt increase in ultor-to-grid-No.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-No.1 voltage.

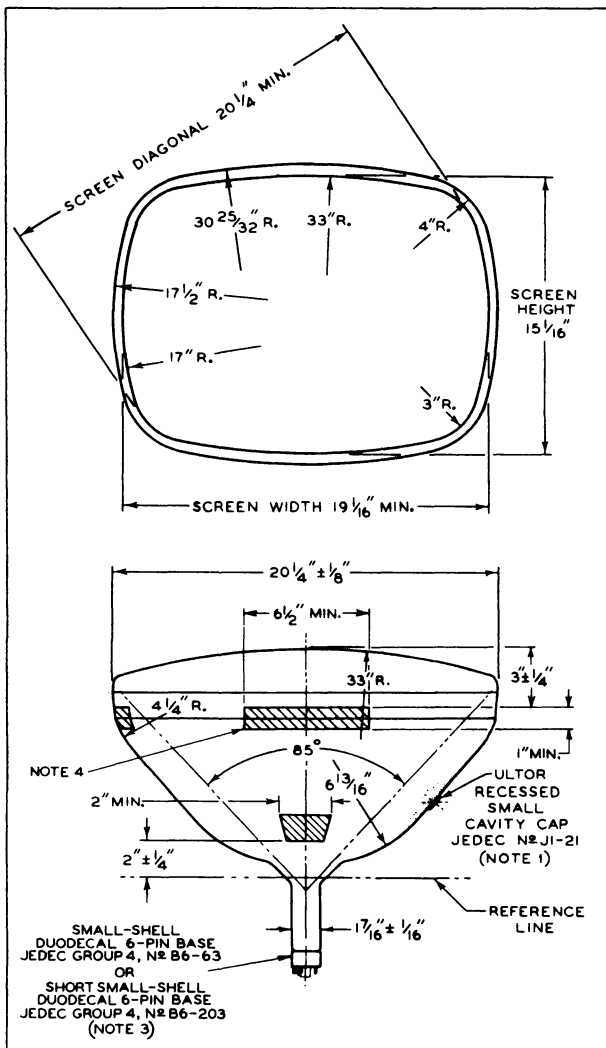
* Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/2". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



2ICXP4

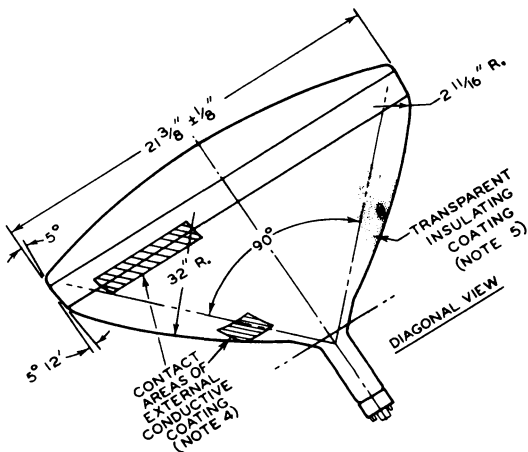
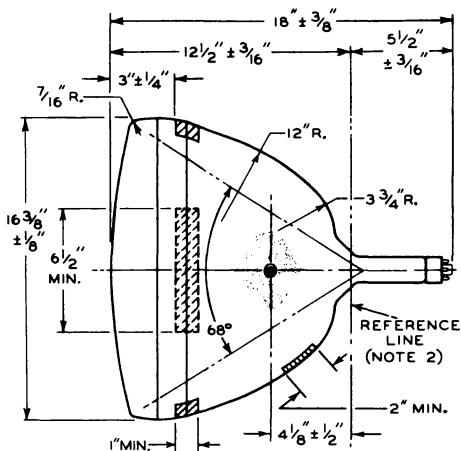
PICTURE TUBE





21CXP4 PICTURE TUBE

21CXP4



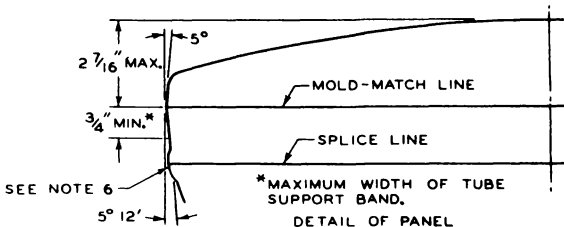
92CL-9910

21CXP4



21CXP4

PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THREE OF FOUR CONTACT AREAS OF THE EXTERNAL CONDUCTIVE COATING. IN ADDITION TO THE 2" x 2" MIN. CONTACT AREA SHOWN, A 6-1/2" x 1" MIN. CONTACT AREA IS PROVIDED IN THE VICINITY OF THE SPLICE LINE ON EACH LONG SIDE OF THE BULB AND ON AT LEAST ONE SHORT SIDE OF THE BULB AS SHOWN. THE ACTUAL AREA OF EXTERNAL CONDUCTIVE COATING WHICH CONNECTS ALL THE CONTACT AREAS WILL BE GREATER THAN THE CONTACT AREAS SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



21CXP4

21CXP4

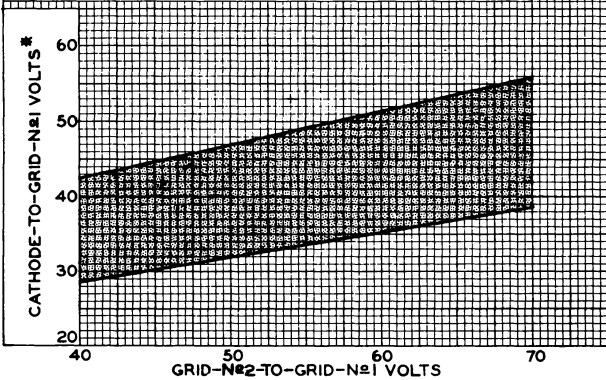
RASTER-CUTOFF-RANGE CHART

$E_f = 6.3$ VOLTS

ULTOR-TO-GRID-N₂ VOLTS = 18000

GRID-N₂ 4-TO-GRID-N₂ 1 VOLTAGE ADJUSTED FOR FOCUS.

*INCREASES OR DECREASES DIRECTLY BY APPROX. 2%
FOR EVERY 1000-VOLT CHANGE IN ULTOR-TO-GRID-N₂
VOLTAGE.



92CS-9911

ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21CXP4



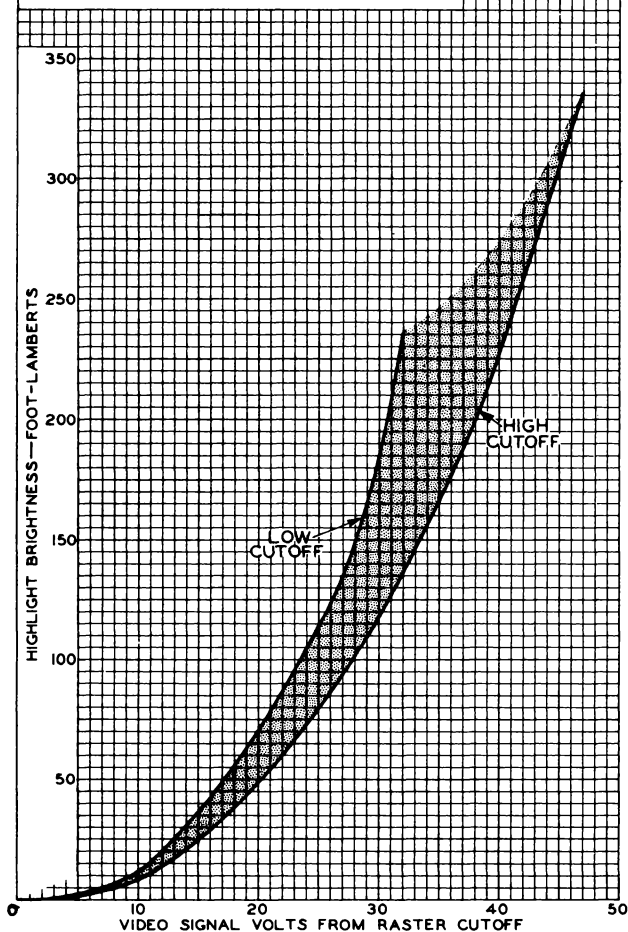
21CXP4

CATHODE-DRIVE CHARACTERISTICS

 $E_f = 6.3$ VOLTSULTOR-TO-GRID-N ϕ 1 VOLTS = 18000GRID-N ϕ 2-TO-GRID-N ϕ 1 VOLTS = 50CATHODE BIASED POSITIVE WITH RESPECT TO GRID-N ϕ 1 TO GIVE FOCUSED RASTER CUTOFF.

RASTER FOCUSED AT AVERAGE BRIGHTNESS.

RASTER SIZE = 18" x 13-1/2"





21CXP4

21CXP4

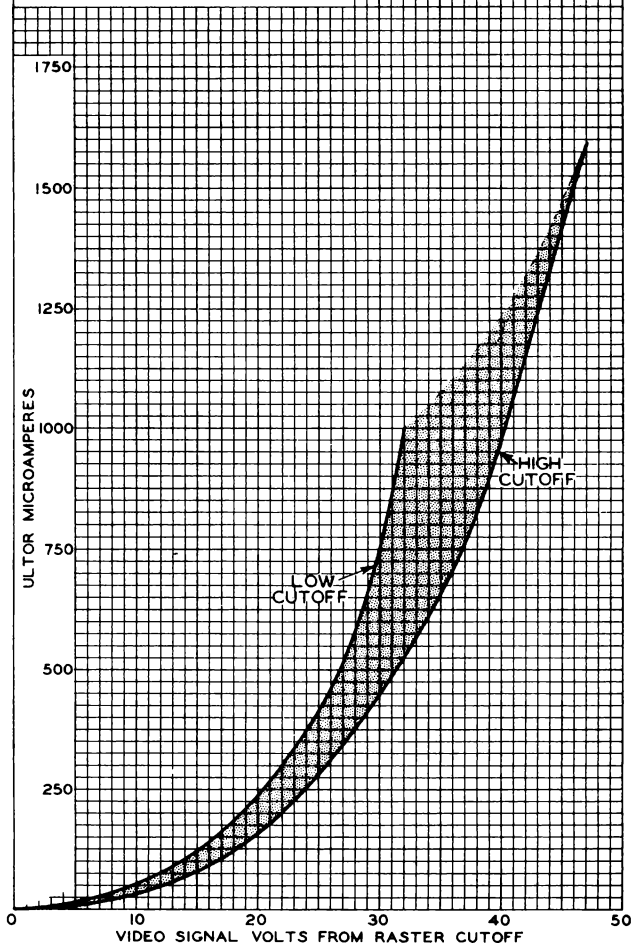
CATHODE-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS

ULTOR-TO-GRID-N^o1 VOLTS = 18000

GRID-N^o2-TO-GRID-N^o1 VOLTS = 50

CATHODE BIASED POSITIVE WITH
RESPECT TO GRID N^o1 TO GIVE
FOCUSED RASTER CUTOFF.





2IDAP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

ALUMINIZED SCREEN

LOW-VOLTAGE ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

*Intended for use in equipment having
series heater-string arrangement*

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3		ac or dc volts
Current	0.6		amp
Warm-up time (Average).	11		sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	μ uf
Cathode to all other electrodes	5	μ uf
External conductive coating to ultor.	{2500 max.	μ uf
	{2000 min.	μ uf

Faceplate, Spherical. Filterglass

Light transmission (Approx.). 74%

Phosphor (For Curves, see front of this Section). .P4—Sulfide Type

Aluminized

Fluorescence. White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal. 110°

Horizontal. 105°

Vertical. 87°

Electron Gun. Type Requiring No Ion-Trap Magnet

Tube Dimensions:

Overall length. 14-11/16" $\pm$ 5/16"

Greatest width. 20-1/4" $\pm$ 1/8"

Greatest height 16-3/8" $\pm$ 1/8"

Diagonal. 21-3/8" $\pm$ 1/8"

Neck length 5-7/16" $\pm$ 1/8"

Screen Dimensions (Minimum):

Greatest width. 19-1/16"

Greatest height 15-1/16"

Diagonal. 20-1/4"

Projected area. 262 sq. in.

Weight (Approx.). 20 lbs

Operating Position. Any

Cap Recessed Small Cavity (JEDEC No. J1-21)

Bulb. J171G1/K1

21DAP4

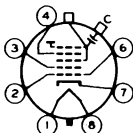


21DAP4 PICTURE TUBE

Base. Small-Button Eightar 7-Pin,
Arrangement 2, (JETEC No.B7-183)

Basing Designation for BOTTOM VIEW. 8HR

Pin 1-Heater
Pin 2-Grid No.1
Pin 3-Grid No.2
Pin 4-Grid No.4
Pin 6-Grid No.1
Pin 7-Cathode
Pin 8-Heater



Cap-Ultor
(Grid No.3,
Grid No.5,
Collector)
C-External
Conductive
Coating

GRID-DRIVE[▲] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to cathode*

Maximum and Minimum Ratings, Design-Center Values:

ULTOR VOLTAGE {18000 max. volts
12000* min. volts

GRID-No.4 (FOCUSING) VOLTAGE:

Positive value. 1000 max. volts

Negative value. 500 max. volts

GRID-No.2 VOLTAGE 500 max. volts

GRID-No.1 VOLTAGE:

Negative-peak value 200 max. volts

Negative-bias value 140 max. volts

Positive-bias value 0 max. volts

Positive-peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period. 180 max. volts

Heater positive with respect to cathode. 180 max. volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 12000 and 18000 volts
and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus[§]. 0 to 400 volts

Grid-No.1 Voltage (E_{c1k})

for visual extinc-

tion of focused raster. . . . See Raster-Cutoff-Range Chart
for Grid-Drive Service

Grid No.1 Video Drive

From Raster Cutoff

(Black Level):

White-level value

(Peak positive) Same value as determined for
 E_{c1k} except video drive is a
positive voltage

* , † , §: See next page.



21EP4-A KINESCOPE

21EP4-A

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf
Cathode to all other electrodes 5 μf
External conductive coating to ultor* $\begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}$ μf

Faceplate, Cylindrical Filterglass

Light transmission (Approx.) 71%

Phosphor (For curves, see front of this section) . . P4—Sulfide Type

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $23" \pm 3/8"$

Greatest width $20-1/4" \pm 1/8"$

Greatest height $15-9/16" \pm 1/8"$

Diagonal $21-7/32" \pm 1/8"$

Screen Dimensions (Minimum):

Greatest width $19-1/8"$

Greatest height $13-7/8"$

Diagonal $20-1/16"$

Projected area 238 sq. in.

Weight (Approx.) 29 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No.J1-21)

Bulb J170

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

Basing Designation for BOTTOM VIEW 12N

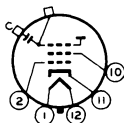
Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Ultor

(Grid No.3,
Collector)

C - External
Conductive
Coating

* The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21EP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21EP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

← Indicates a change.

NOV. 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1

21EP4-A



21EP4-A

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	18000 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design ranges:

For any ultor voltage (E_{c3}) between 14000* and 18000 volts
and grid-No.2 voltage (E_{c2}) between 200 and 500 volts

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.2 Current.	-15 to +15	μ amp
Focusing-Coil Current (DC) ^{oo}	$\left[\sqrt{\frac{E_{c2}}{16000}} \times 110 \right] \pm 20\%$	ma
Ion-Trap Magnet Current		
(Average) ^{**}	$\sqrt{\frac{E_{c3}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c3}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	14000	16000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.1 Voltage for			
Visual Extinction of			
Focused Raster	-28 to -72	-28 to -72	volts
Focusing-Coil Current (DC)	103 $\pm$ 20%	110 $\pm$ 20%	ma
Minimum Field Strength of			
PM Ion-Trap Magnet	31	33	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

^{oo,§}: See next page.

→ Indicates a change.

NOV. 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1



21EP4-A

KINESCOPE

21EP4-A

- 00 For specimen focusing coil similar to JETEC Focusing Coil No. 109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (*See Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No. 1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a $19\frac{1}{8}'' \times 13\frac{7}{8}''$ picture size.
- § For specimen PM ion-trap magnet, such as Heppner Model No. EW37, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

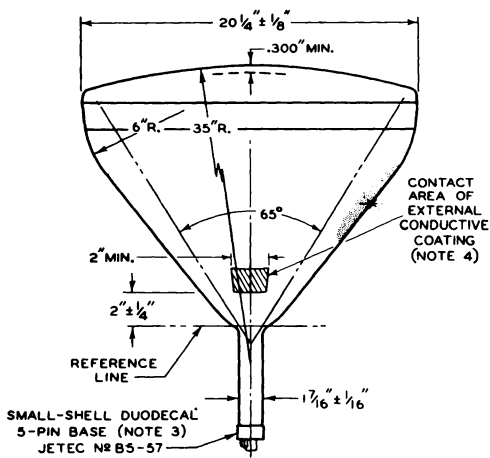
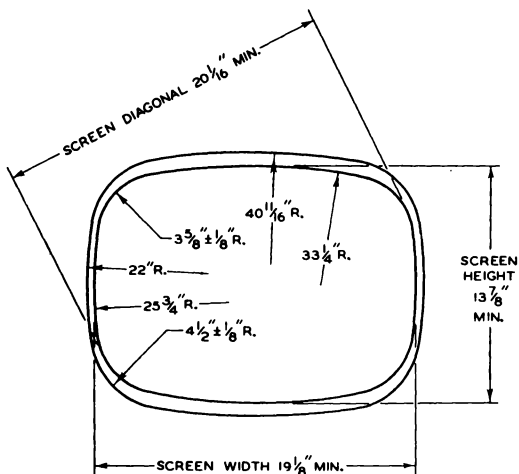
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

AVERAGE GRID-DRIVE CHARACTERISTICS
for Type 21EP4-A are the same as those shown for
Type 21AVP4/21AUP4

21EP4-A



21EP4-A KINESCOPE



NOV. 1, 1955

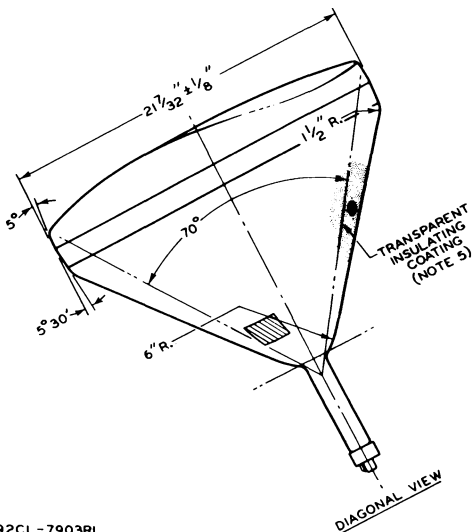
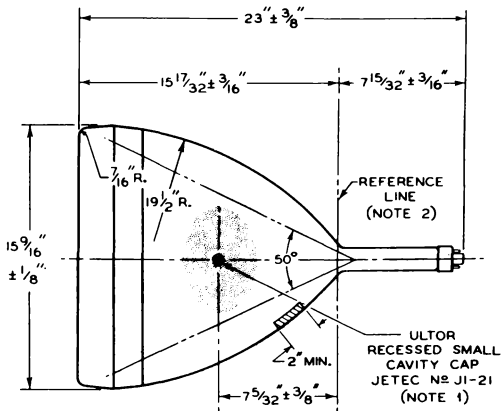
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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7903R1A



21EP4-A KINESCOPE

21EP4-A



92CL-7903RI

NOV. 1, 1955

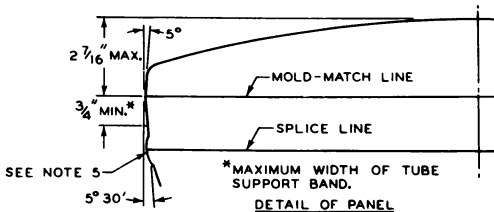
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7903R1B

2IEP4-A



2IEP4-A KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDING.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16$ " BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



21EP4-B KINESCOPE

21EP4-B

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 21EP4-B is the same as the 21EP4-A except for the following item:

Phosphor (For curves, see front of this Section). . P4—Sulfide Type
Aluminized

HIGHLIGHT BRIGHTNESS vs DRIVE CURVES
for Type 21EP4-B are the same as those shown for
Type 21ALP4-A



21FP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

21FP4-A

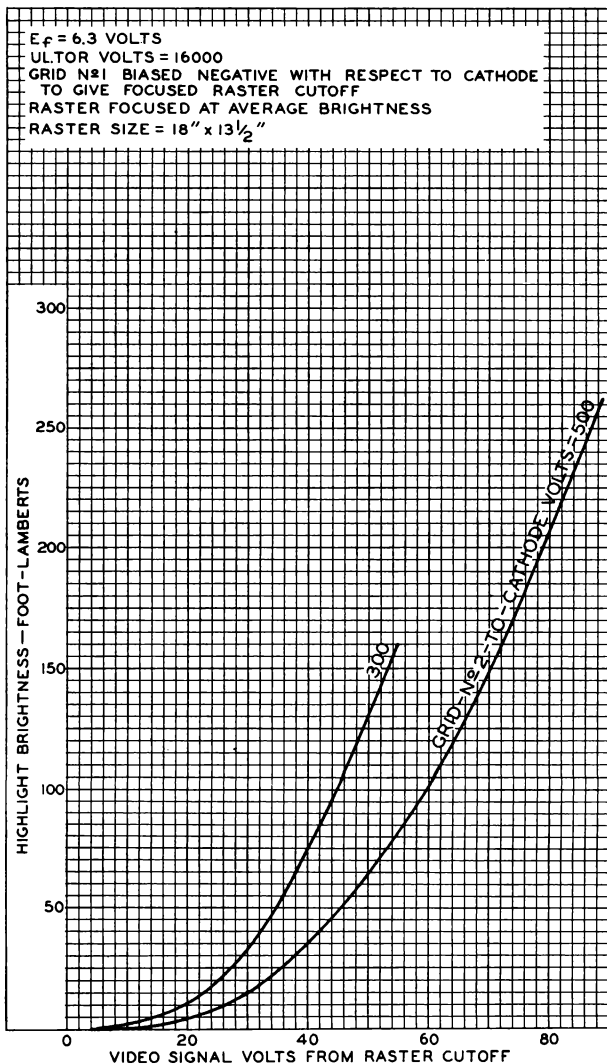
The 21FP4-A is the same as the 21FP4-C except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

2IFP4-A



2IFP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8917



21FP4-C

KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

21FP4-C

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf
Cathode to all other electrodes. 5 μf
External conductive coating to ultor $\begin{cases} 750 \text{ max. } \mu\text{f} \\ 500 \text{ min. } \mu\text{f} \end{cases}$

Faceplate, Cylindrical Filterglass

Light transmission (Approx.) 71%

Phosphor (For Curves, see front of this Section). . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°
Horizontal 65°
Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $23" \pm 3/8"$
Greatest width $20-1/4" \pm 1/8"$
Greatest height. $15-9/16" \pm 1/8"$
Diagonal $21-7/32" \pm 1/8"$
Neck length. $7-15/32" \pm 3/16"$

Screen Dimensions (Minimum):

Greatest width $19-1/8"$
Greatest height. $13-7/8"$
Diagonal $20-1/16"$
Projected area 238 sq.in.

Weight (Approx.) 29 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J-170

Base Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1 — Heater

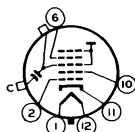
Pin 2 — Grid No.1

Pin 6 — Grid No.4

Pin 10 — Grid No.2

Pin 11 — Cathode

Pin 12 — Heater



Cap — Ultor

(Grid No.3,

Grid No.5,

Collector)

C — External
Conductive
Coating



2IFP4-C

KINESCOPE

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5}) between 14000# and 18000 volts
and grid-No.2 voltage (E_{c2}) between 200 and 500 volts

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp.	-0.4% to +2.2% of E_{c5}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.1 Video Drive from		
Raster Cutoff (Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2}	volts
Grid-No.4 Current.	-25 to +25	μ amp
Grid-No.2 Current.	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average)**	$\sqrt{\frac{E_{c5}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet §	$\sqrt{\frac{E_{c5}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.



2IFP4-C KINESCOPE

2IFP4-C

Examples of Use of Design Ranges:

With ultor voltage of	14000	16000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp . . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value			
(Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	31	33	gausses

Maximum Circuit Values:

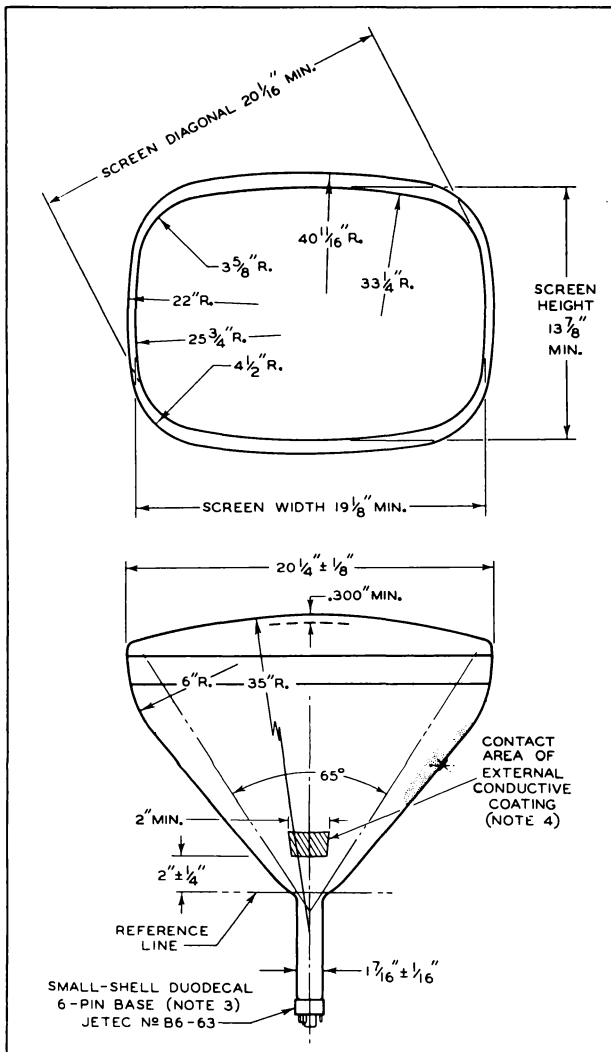
Grid-No.1-Circuit Resistance	1.5 max.	megohms
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*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

21FP4-C



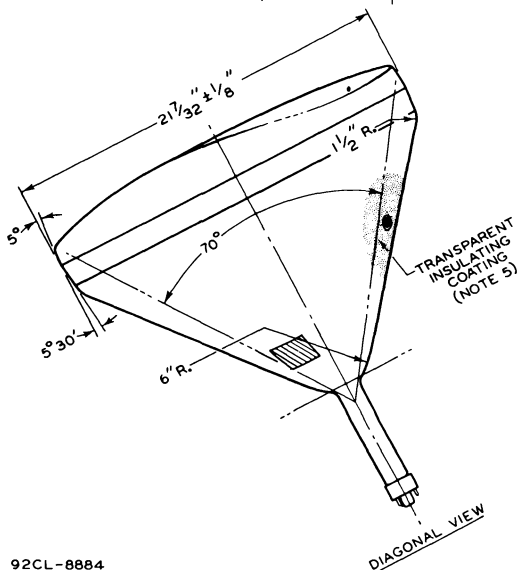
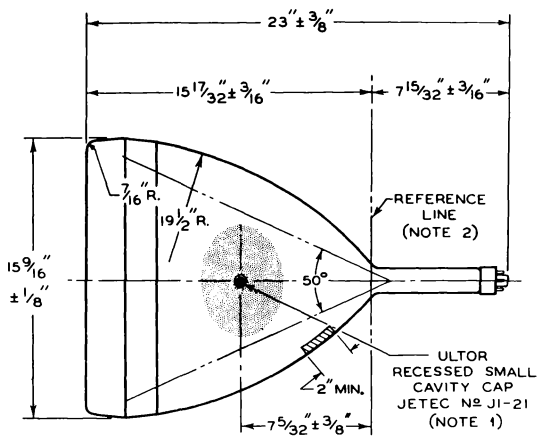
21FP4-C KINESCOPE





21FP4-C KINESCOPE

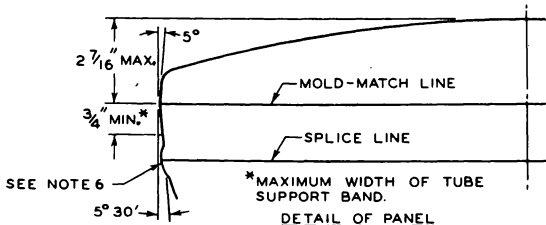
21FP4-C



92CL-8884



2IFP4-C KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

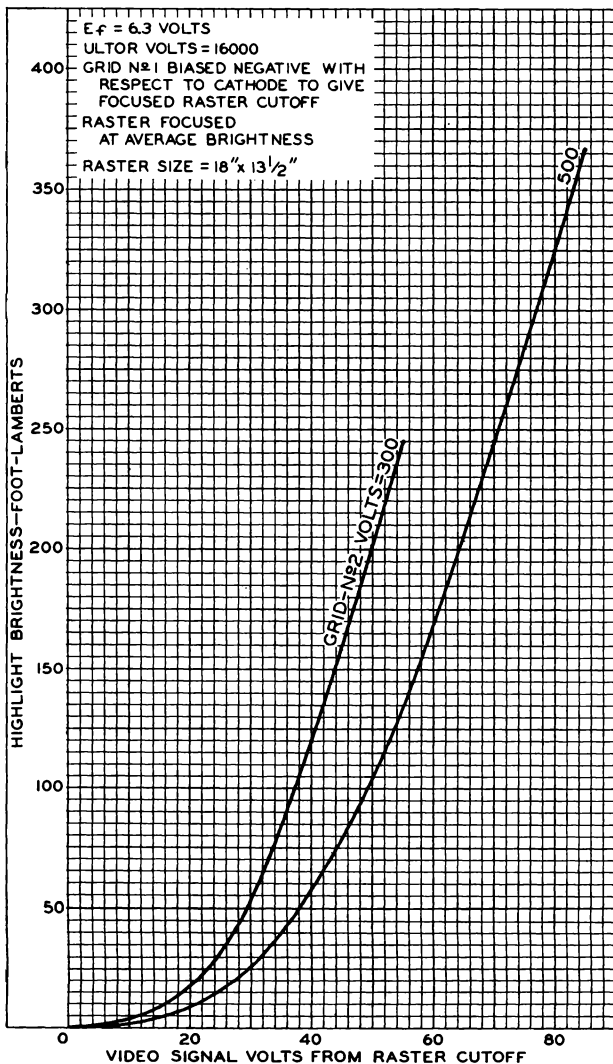
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16$ " BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



2IFP4-C

2IFP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS

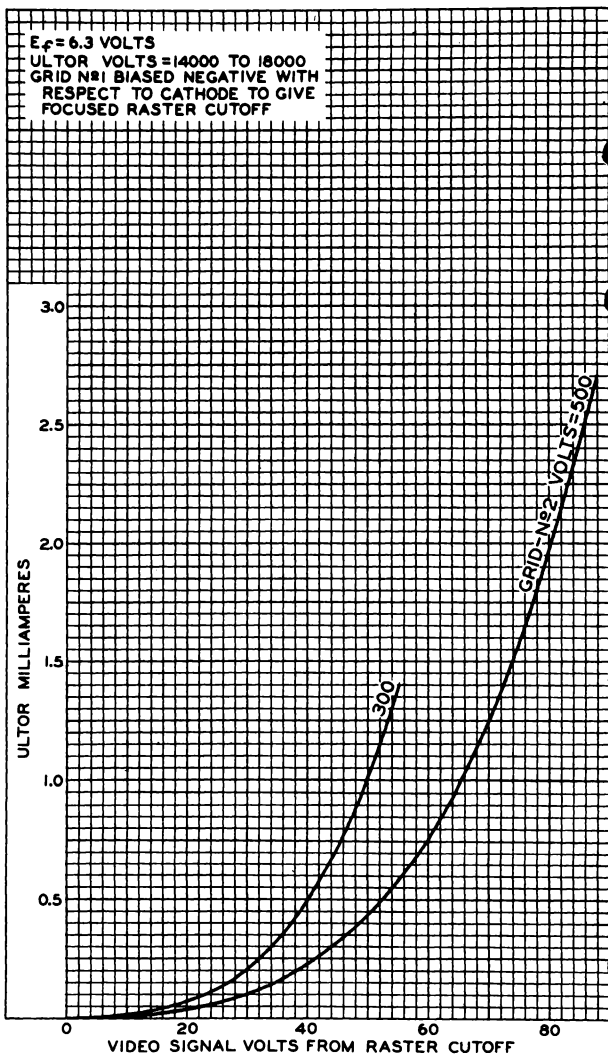


21FP4-C



21FP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8920



21MP4 KINESCOPE

21MP4

RECTANGULAR METAL-SHELL TYPE
LOW-VOLTAGE FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes. 6 μf
Cathode to All Other Electrodes. 5 μf

Faceplate, Spherical Frosted Filterglass

Light Transmission (Approx.) 66%

Phosphor (For Curves, see front of this Section) P4—Sulfide Type

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 70°
Horizontal 66°
Vertical 50°

Ion-Trap Gun Requires External, Single-Field Magnet

Tube Dimensions:

Maximum Overall Length 22-5/8"
Greatest Diagonal. 20-3/4" $\pm$ 1/4"
Greatest Width 19-23/32" $\pm$ 1/8"
Greatest Height. 15-5/16" $\pm$ 1/8"

Screen Dimensions:

Greatest Width 18-3/8"
Greatest Height. 14"
Diagonal 19-3/8"

Weight (Approx.) 18 lbs

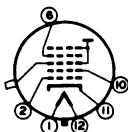
Mounting Position. Any

Ultor® Terminal. Metal-Shell Lip

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

Pin 1—Heater
Pin 2—Grid No.1
Pin 6—Grid No.4
Pin 10—Grid No.2
Pin 11—Cathode



Pin 12—Heater
Metal-Shell Lip—
Grid No.3,
Grid No.5,
Collector

Maximum Ratings, Design-Center Values:

ULTOR® VOLTAGE 16000 max. volts

In the 21MP4, grid No.5 which has the ultor function, grid No.3, and collector are connected together within the tube and are conveniently referred to collectively as "ultor." The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

MAY 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2IMP4



2IMP4 KINESCOPE

GRID-No.4 VOLTAGE:

Positive value 1000 max. volts

Negative value*. 500 max. volts

GRID-No.2 VOLTAGE. 500 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 125 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode. 180 max. volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 14000 and 16000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 500 volts*

Grid-No.4 Voltage for Focus

with Ultor Current of

100 μ amp -0.4% to +2.2% of E_u volts

Grid-No.1 Voltage for Visual

Extinction of Undelected

Focused Spot 11% to 25.7% of E_{c2} volts

Grid-No.4 Current. -25 to +25 μ amp

Grid-No.2 Current. -15 to +15 μ amp

Field Strength of Single-Field

Ion-Trap Magnet (Approx.). $\sqrt{\frac{E_u}{14000}} \times 45$ gaussess

Field Strength of Adjustable

Centering Magnet 0 to 8 gaussess

Examples of Use of Design Ranges:

For ultor voltage of 14000 16000 volts

and grid-No. 2 voltage of. 300 300 volts

Grid-No.4 Voltage for Focus

with Ultor Current of

100 μ amp -55 to +300 -65 to +350 volts

Grid-No.1 Voltage† -33 to -77 -33 to -77 volts

Ion-Trap Magnet

(Rated Strength) 45 50 gaussess

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

† Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

‡ For visual extinction of undelected focused spot.

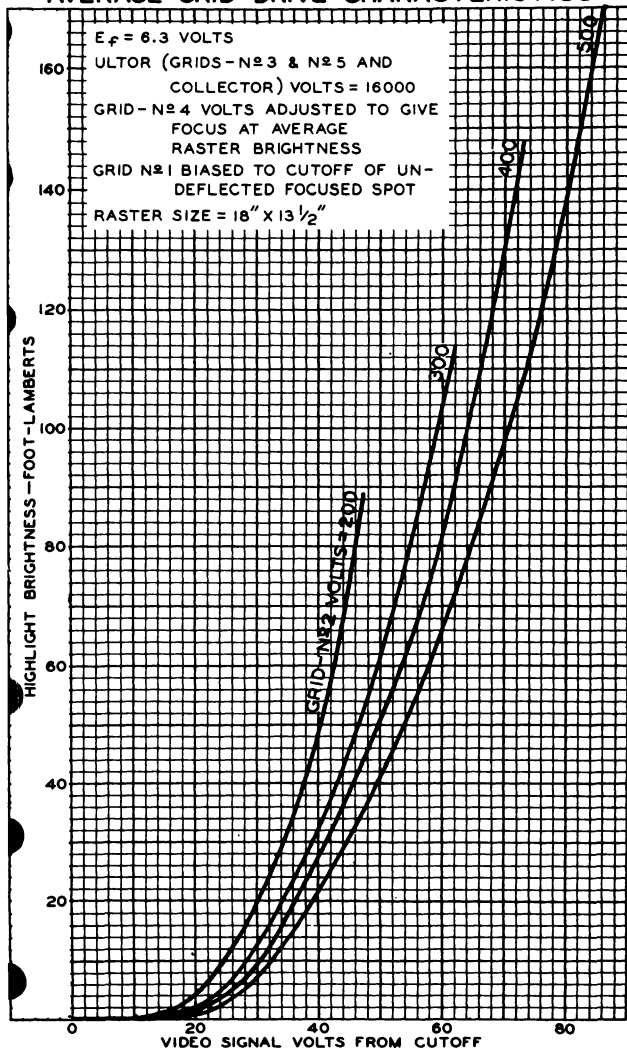
For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section



2IMP4

2IMP4

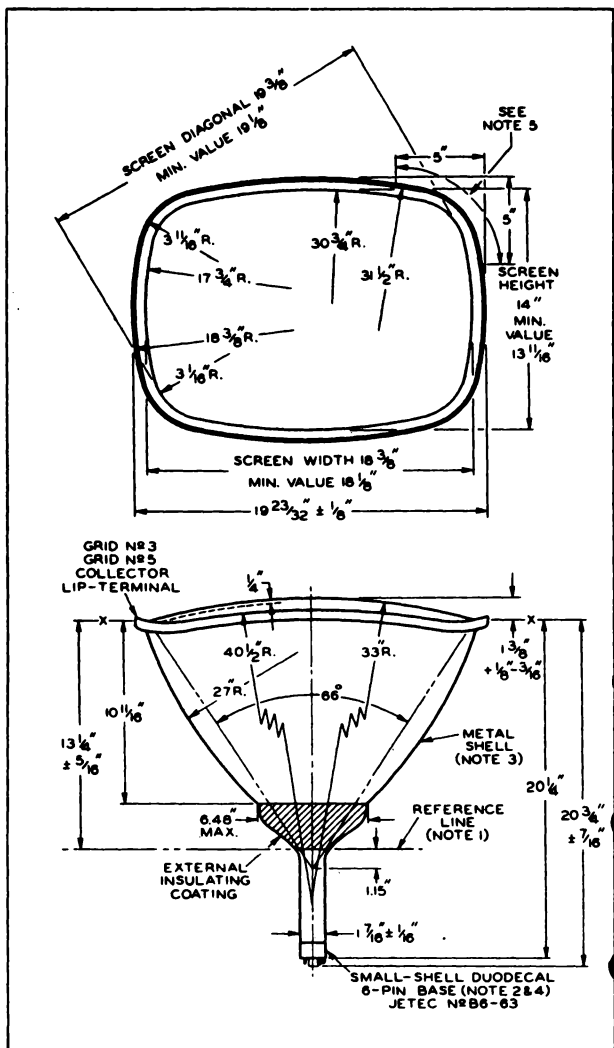
AVERAGE GRID-DRIVE CHARACTERISTICS



2IMP4



2IMP4 KINESCOPE



MAY 1, 1952

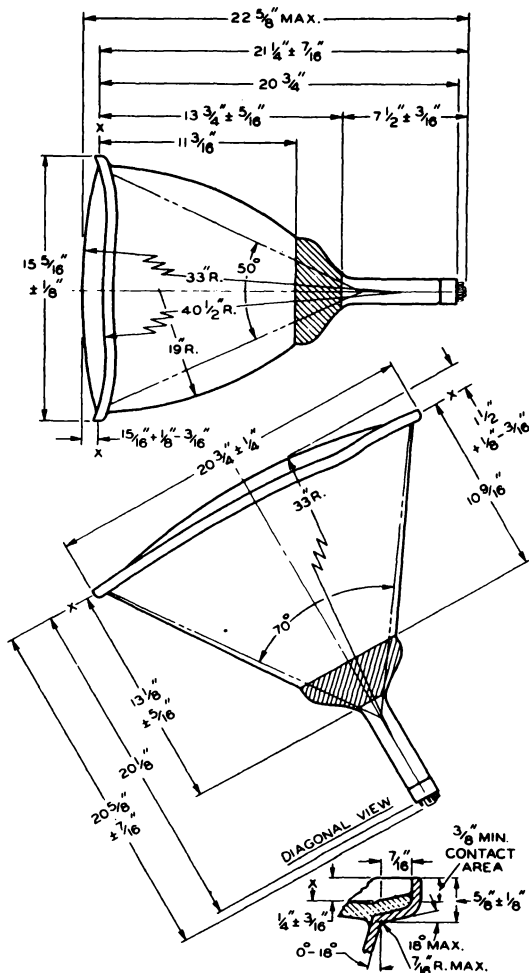
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7646R1A



2IMP4 KINESCOPE

2IMP4



92CL-7646RI

FOR NOTES. SEE NEXT PAGE

MAY 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7646R1B

2IMP4



2IMP4 KINESCOPE

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING A DIAMETER OF 3-1/4".

NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND PIN NO. 6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.

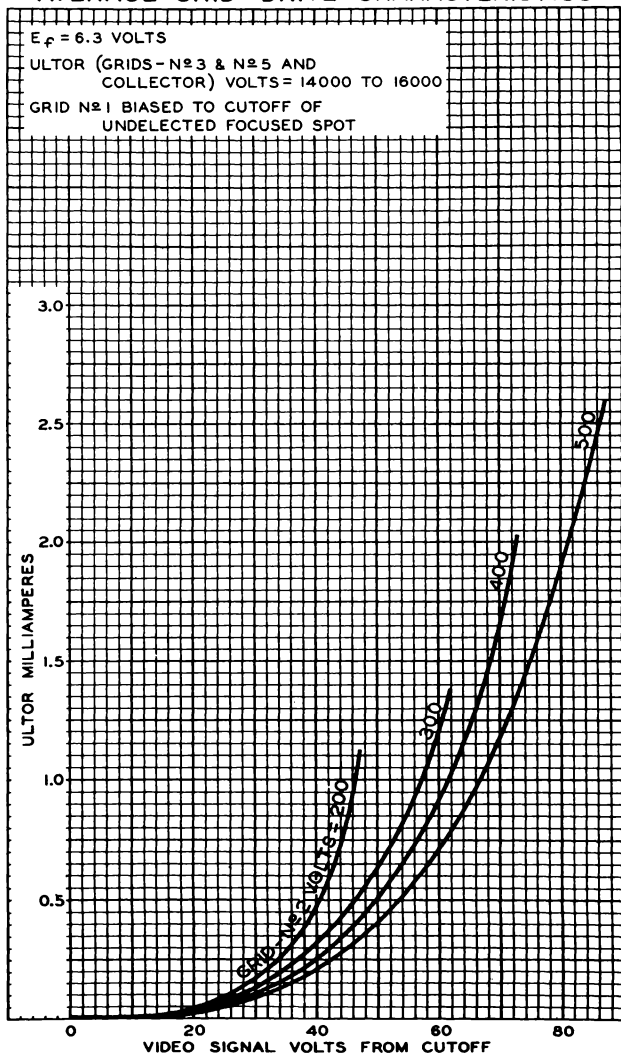
NOTE 5: SUPPORT TUBE IN LIP REGION ONLY AT CORNERS WITHIN THIS SPACE.



2IMP4

2IMP4

AVERAGE GRID-DRIVE CHARACTERISTICS



NOV. 29, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7714



21WP4, 21WP4-A PICTURE TUBES

RECTANGULAR GLASS TYPES

MAGNETIC FOCUS

MAGNETIC DEFLECTION

21WP4
21WP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. 0.6 $\pm$ 10% amp

Capacitance between External Conductive

Coating and Ultor. $\left\{ \begin{array}{l} 750 \text{ max.} \\ 500 \text{ min.} \end{array} \right. \mu\text{f}$

Faceplate, Spherical Filterglass

Phosphor (For curves,
see front of this
section).

Type 21WP4

P4—Sulfide Type

Type 21WP4-A

P4—Sulfide Type

Aluminized

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Electron Gun Ion-Trap Type Requiring
External Single-Field Magnet

Tube Dimensions:

Overall length 22-7/16" $\pm$ 3/8"

Greatest width 18-11/16" $\pm$ 1/8"

Greatest height. 14-15/16" $\pm$ 1/8"

Diagonal 20-5/8" $\pm$ 3/16"

Neck length. 7-1/2" $\pm$ 3/16"

Radius of curvature of faceplate (External surface). . 40"

Screen Dimensions (Minimum):

Greatest width 17-3/8"

Greatest height. 13-5/8"

Diagonal 19-1/2"

Projected area 224 sq. in.

Operating Position Any

Cap. Recessed Small Cavity (JEDEC No. J1-21)

Base . . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No. B5-57)

Basing Designation for BOTTOM VIEW 12N

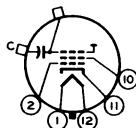
Pin 1—Heater

Pin 2—Grid No.1

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,

Collector)

C—External

Conductive

Coating

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE. 18000 max. volts

GRID—No.2 VOLTAGE. 500 max. volts

GRID—No.1 VOLTAGE:

Negative-bias value. 125 max. volts

Positive-bias value. 0 max. volts

Positive-peak value. 2 max. volts

2IWP4
2IWP4-A



2IWP4, 2IWP4-A PICTURE TUBES

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



21XP4-A

PICTURE TUBE

RECTANGULAR GLASS TYPE

ALUMINIZED SCREEN

LOW-VOLTAGE ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

21XP4-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts

Current. $0.6 \pm 10\%$ amp

Capacitance between External Conductive

Coating and Ultor. $\begin{cases} 2500 \text{ max.} & \mu\mu\text{f} \\ 2000 \text{ min.} & \mu\mu\text{f} \end{cases}$

Faceplate, Spherical Filterglass

Phosphor (For curves, see front of this section) . P4—Sulfide Type
Aluminized

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 66°

Vertical 50°

Electron Gun Ion-Trap Type Requiring
External Single-Field Magnet

Tube Dimensions:

Overall length $22-7/16" \pm 3/8"$

Greatest width $18-11/16" \pm 1/8"$

Greatest height $14-15/16" \pm 1/8"$

Diagonal $20-5/8" \pm 3/16"$

Neck length. $7-1/2" \pm 3/16"$

Radius of curvature of faceplate (External surface). . $40"$

Screen Dimensions (Minimum):

Greatest width. $17-3/8"$

Greatest height. $13-5/8"$

Diagonal $19-1/2"$

Projected area 224 sq. in.

Operating Position Any

Cap. Recessed Small Cavity (JEDEC No. J1-21)

Base . . Small-Shell Duodecal 6-Pin (JEDEC Group 4, No. B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1—Heater

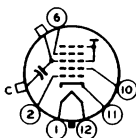
Pin 2—Grid No.1

Pin 6—Grid No.4

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,

Grid No.5,

Collector)

C—External

Conductive

Coating

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE. 18000 max. volts

GRID-No.4 (FOCUSING) VOLTAGE:

Positive value 1000 max. volts

Negative value 500 max. volts

GRID-No.2 VOLTAGE. 500 max. volts

21XP4-A



21XP4-A PICTURE TUBE

GRID-No.1 VOLTAGE:

Negative-bias value.	125 max.	volts
Positive-bias value.	0 max.	volts
Positive-peak value.	2 max.	volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts

Heater positive with respect to cathode.	180 max.	volts
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Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



21YP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS

MAGNETIC DEFLECTION

21YP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf Cathode to all other electrodes 5 μf External conductive coating to ultor $\left\{ \begin{array}{l} 750 \text{ max.} \\ 500 \text{ min.} \end{array} \right.$ μf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 75%

Phosphor (For curves, see front of this Section) . . . P4—Sulfide Type

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length 23-1/32" $\pm$ 3/8"Greatest width 20-1/4" $\pm$ 1/8"Greatest height 15-9/16" $\pm$ 1/8"Diagonal 21-7/32" $\pm$ 1/8"

Screen Dimensions (Minimum):

Greatest width 19-1/8"

Greatest height 14-3/16"

Diagonal 20-1/8"

Projected area 245 sq. in.

Weight (Approx.) 24 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No. J1-21)

Bulb J170

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

Pin 1—Heater

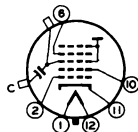
Pin 2—Grid No.1

Pin 6—Grid No.4

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,

Grid No.5,

Collector)

C—External

Conductive

Coating

^o The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam power to its deflection. In the 21YP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.3 and collector are connected together within the 21YP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

AUG. 16, 1954

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21YP4



21YP4

KINESCOPE

GRID-DRIVE^A SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . .	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 14000 and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive) .	9.3% to 24% of E_{c2k}	olts
Grid-No.4 Current	-25 to +25	μ amp
Grid-No.2 Current	-15 to +15	μ amp
Field Strength of Single-Field		
Ion-Trap Magnet (Approx.) .	$\sqrt{\frac{E_{c5k}}{14000}} \times 40$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

^A Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

^B, * : See next page.



21YP4

KINESCOPE

21YP4

Examples of Use of Design Ranges:

With ultor voltage of	16000	18000	volts
and grid-No.2 voltage of	300	300	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp . . .	-65 to +350	-70 to +395	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive) . . .	28 to 72	28 to 72	volts
Field Strength of Ion-Trap Magnet	43	45	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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CATHODE-DRIVE^{*} SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

* Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

• This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

* See next page.

21YP4



21YP4

KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 14000* and 18000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp 0% to +2.6% of E_{c5g1} volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 8.5% to 19.4% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 8.5% to 19.4% of E_{c2g1} volts

Grid-No.4 Current

-25 to +25 μ amp

Grid-No.2 Current

-15 to +15 μ amp

Field Strength of Single-Field

Ion-Trap Magnet (Approx.) .

 $\sqrt{\frac{E_{c5g1}}{14000}} \times 40$ gaussess

Field Strength of Adjustable

Centering Magnet

0 to 8 gaussess

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of 16000 18000 volts
and grid-No.2-to-grid-No.1 voltage of 300 300 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor Current

of 100 μ amp 0 to 415 0 to 470 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction of

Focused Raster 25 to 58 25 to 58 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 25 to 58 25 to 58 volts

Field Strength of

Ion-Trap Magnet 43 45 gaussess

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . 1.5 max. megohms

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section.

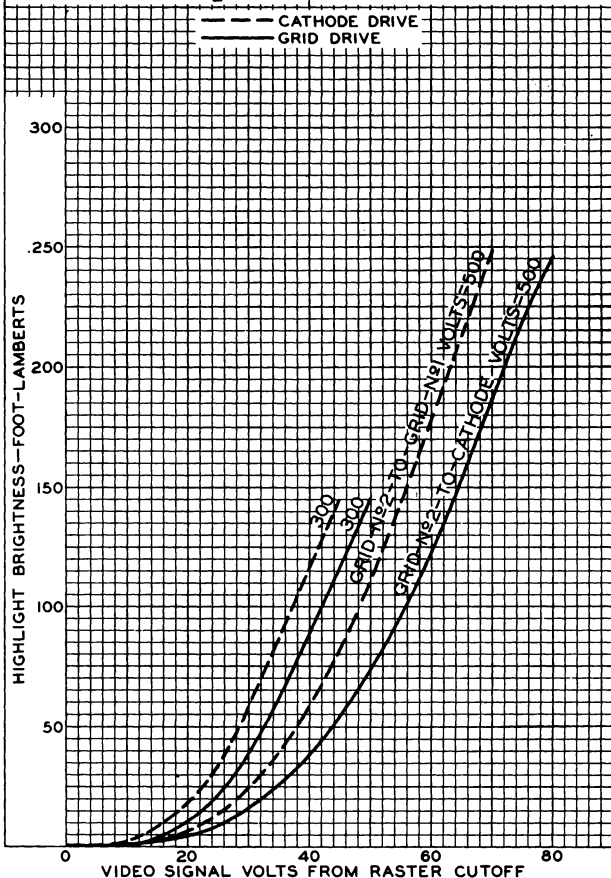


21YP4

21YP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE = 18" x 13½"	RASTER SIZE 18" x 13½"



AUG. 5, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

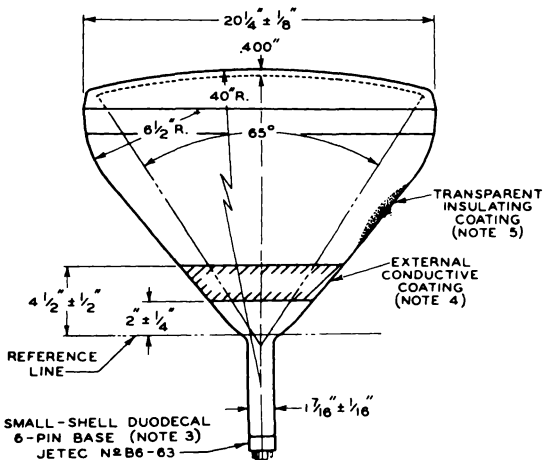
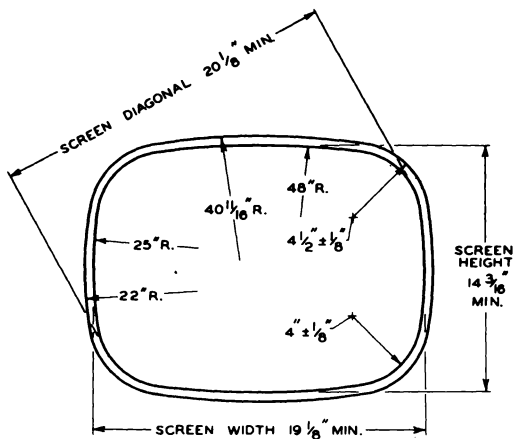
92CM-8368

21YP4



21YP4

KINESCOPE



AUG. 16, 1954

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

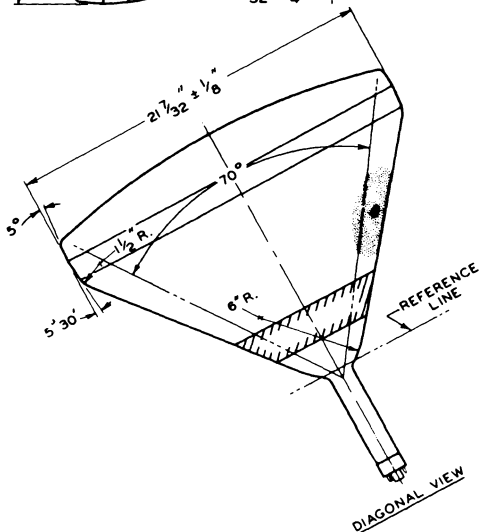
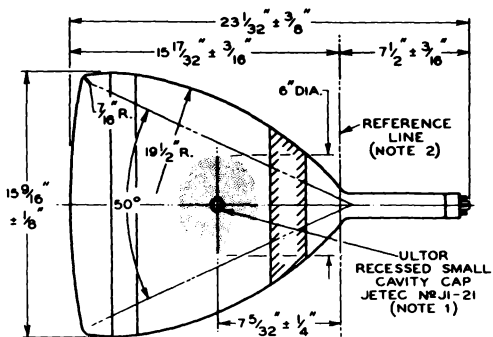
CE-8237A



21YP4

KINESCOPE

21YP4



92CL - 8237

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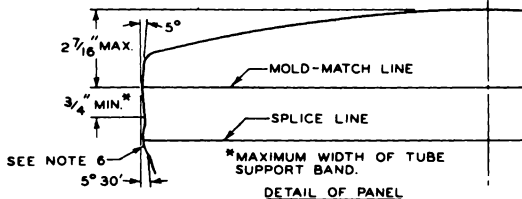
CE-8237B

21YP4



21YP4

KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. BULB TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA. WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

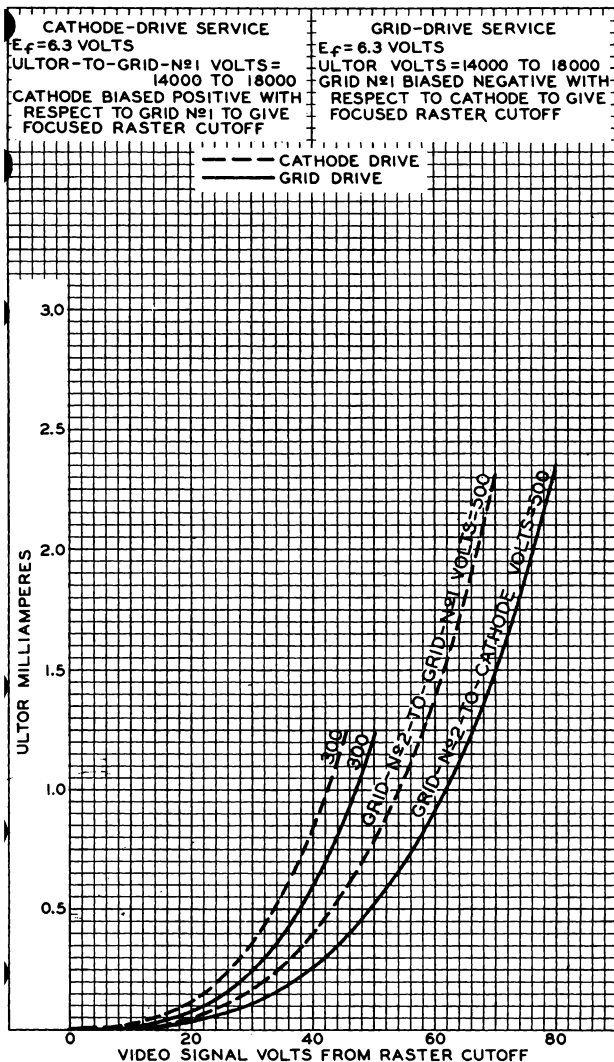
NOTE 6: SEAL BULGE MAY PROTRUDE NOT MORE THAN 1/8" BEYOND MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL, OR HEIGHT.



21YP4

21YP4

AVERAGE DRIVE CHARACTERISTICS



AUG. 9, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8224R1



21YP4-A

21YP4-A

KINESCOPE

The 21YP4-A is like the 21YP4 except that it has a *metal-backed screen* and greater light output as shown by the curves on the back of this page.

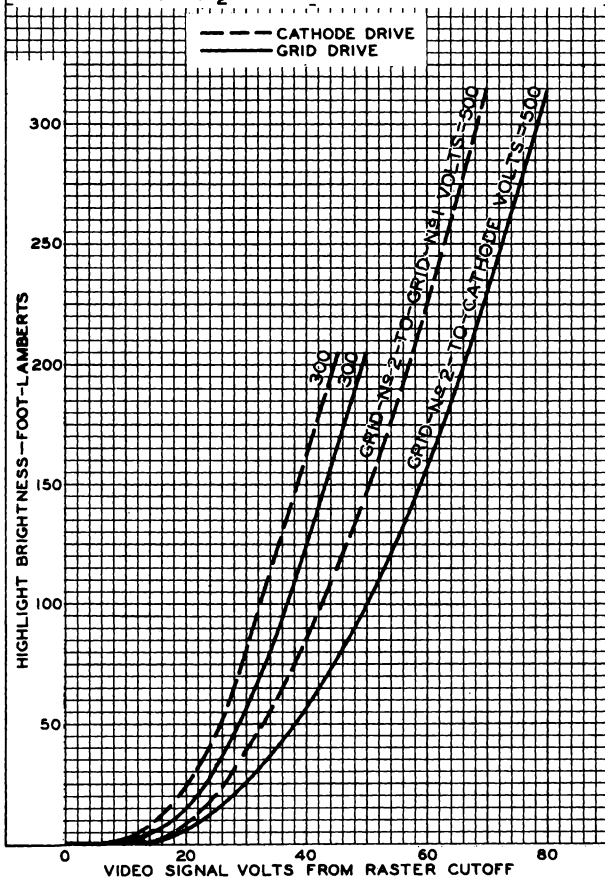
21YP4-A



21YP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID- N_2 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID N_2 TO GIVE FOCUSED RASTER CUTOFF	GRID N_2 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE = $18" \times 13\frac{1}{2}"$	RASTER SIZE $18" \times 13\frac{1}{2}"$



AUG. 5, 1954

TUBE DIVISION

92CM-8367

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21ZP4-A

21ZP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf Cathode to all other electrodes 5 μf External conductive coating to ultor $\begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light Transmission (Approx.) 75%

Phosphor (For curves, see front of this Section). P4—Sulfide Type

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 70°

Horizontal 65°

Vertical 50°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length 23-1/32" $\pm$ 3/8"Greatest width 20-1/4" $\pm$ 1/8"Greatest height 15-9/16" $\pm$ 1/8"Diagonal 21-7/32" $\pm$ 1/8"

Screen Dimensions (Minimum):

Greatest width 19-1/8"

Greatest height 14-3/16"

Diagonal 20-1/8"

Projected area 245 sq in

Weight (Approx.) 24 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No.J1-21)

Bulb J170

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

BOTTOM VIEW

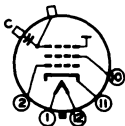
Pin 1—Heater

Pin 2—Grid No.1

Pin 10—Grid No.2

Pin 11—Cathode

Pin 12—Heater



Cap—Ultor

(Grid No.3,
Collector)C—External
Conductive
Coating

The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21ZP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21ZP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

AUG. 16, 1954

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ZP4-A



21ZP4-A

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE 18000 max. volts

GRID-No.2 VOLTAGE 500 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds . . . 410 max. volts

After equipment warm-up period . . . 180 max. volts

Heater positive with respect to cathode . 180 max. volts

Equipment Design Ranges:

With any ultor voltage (E_{c2k}) between 14000 and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for

Visual Extinction of

Focused Raster -9.3% to -24% of E_{c2k} volts

Grid-No.1 Video Drive

from Raster Cutoff

(Black Level):

White-level value

(Peak positive) 9.3% to 24% of E_{c2k} voltsGrid-No.2 Current -15 to +15 μ ampFocusing-Coil Current (DC)^o . $\left[\sqrt{\frac{E_{c3k}}{14000}} \times 104 \right] \pm 10\%$ ma

Field Strength of Single-Field

Ion-Trap Magnet (Approx.) .

 $\sqrt{\frac{E_{c3k}}{14000}} \times 42$ gauss

Field Strength of Adjustable

Centering Magnet 0 to 8 gauss

Examples of Use of Design Ranges:

With ultor voltage of 16000 18000 volts

and grid-No.2 voltage of 300 300 volts

Grid-No.1 Voltage for

Visual Extinction of

Focused Raster -28 to -72 -28 to -72 volts

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

*,^o: See next page.

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TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



21ZP4-A

KINESCOPE

21ZP4-A

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	28 to 72	volts
Focusing-Coil Current (DC)	$110 \pm 10\%$	$118 \pm 10\%$	ma
Field Strength of Ion-Trap Magnet	45	48	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
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CATHODE-DRIVE⁰ SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c3g1}) between 14000 and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts*

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of E_{c2g1}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of E_{c2g1}	volts

⁰ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

⁰: See next page.

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TUBE DIVISION

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ZP4-A



21ZP4-A

KINESCOPE

Grid-No.2 Current	-15 to +15	μamp
Focusing-Coil Current (DC)° . .	$\left[\sqrt{\frac{E_c 3g_1}{14000}} \times 104 \right] \pm 10\%$	
Field Strength of Single-Field Ion-Trap Magnet (Approx.) . .	$\sqrt{\frac{E_c 3g_1}{14000}} \times 42$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-No.1</i>			
voltage of	16000	18000	volts
<i>and grid-No.2-to-grid-No.1</i>			
voltage of	300	300	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value			
(Peak negative)	25 to 58	25 to 58	volts
Focusing-Coil Current (DC) . . .	110 ± 10%	118 ± 10%	ma
Field Strength of Ion-Trap Magnet	45	48	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohm
--	----------	--------

° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (See *Dimensional Outline*). The indicated current is for condition with combined grid-No.1 bias voltage and video signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 19-1/8" x 14-3/16" picture area sharply focused at center of screen.

*For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section.*

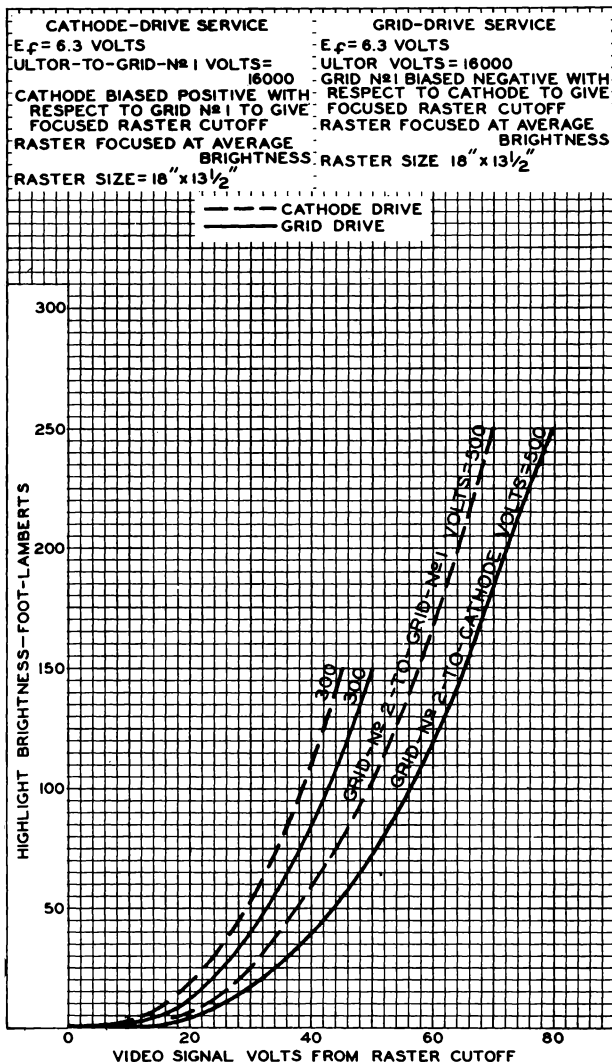
*Ultor current vs Drive Curves
are the same as shown for Type 21YP4*



21ZP4-A

21ZP4-A

AVERAGE DRIVE CHARACTERISTICS



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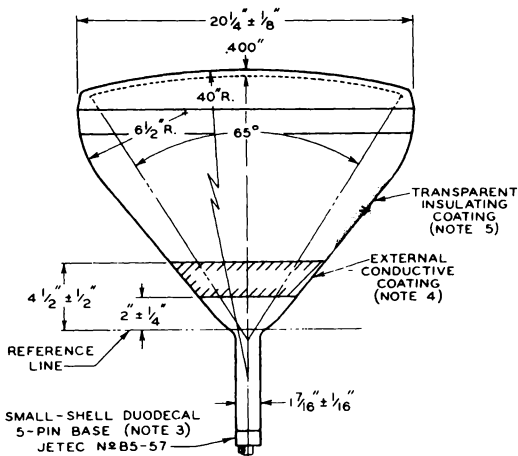
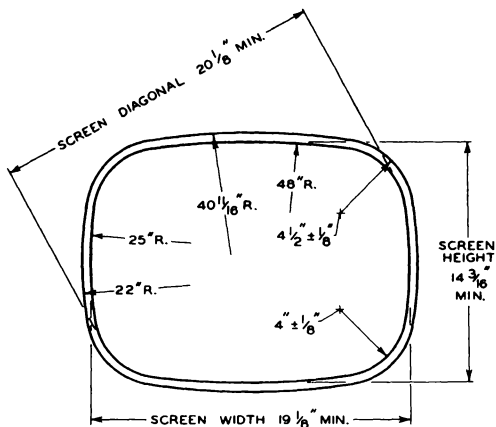
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8391

21ZP4-A



21ZP4-A KINESCOPE



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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

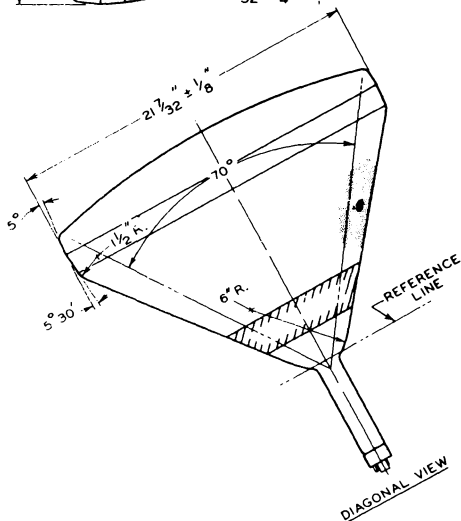
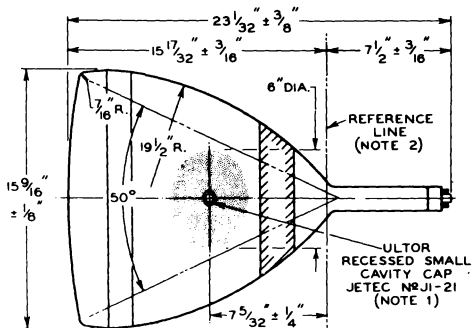
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21ZP4-A

KINESCOPE

21ZP4-A



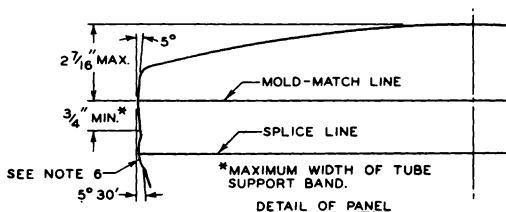
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21ZP4-A



21ZP4-A

KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. BULB TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: SEAL BULGE MAY PROTRUDE NOT MORE THAN $1/8$ " BEYOND MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL, OR HEIGHT.



21ZP4-B

KINESCOPE

21ZP4-B

The 21ZP4-B is like the 21ZP4-A except that it has a *metal-backed screen* and greater light output as shown by the curves on the back of this page.

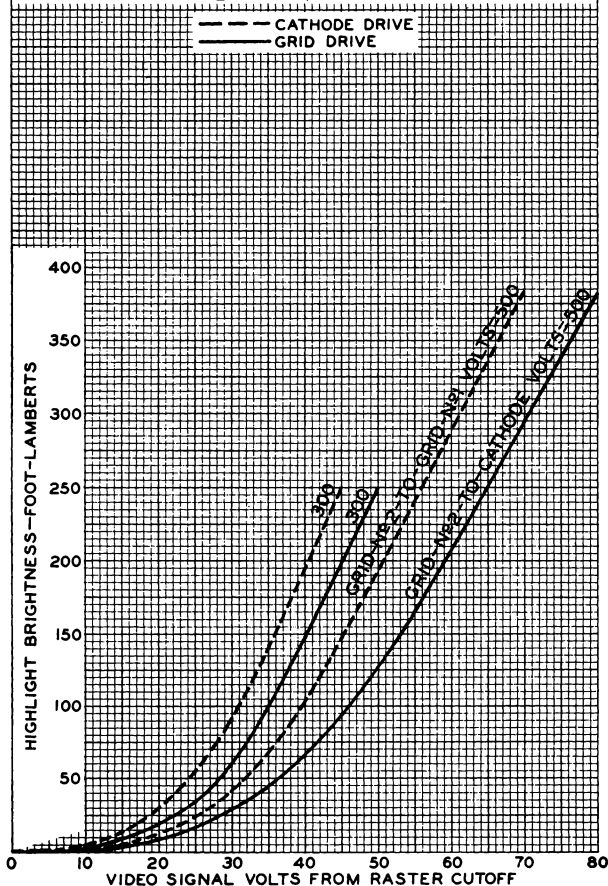
21ZP4-B



21ZP4-B

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N $\#$ 1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID N $\#$ 1 TO GIVE FOCUSED RASTER CUTOFF	GRID N $\#$ 1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE = 18" x 13 1/2"	RASTER SIZE 18" x 13 1/2"



AUG. 9, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8225RI



24AUP4

PICTURE TUBE

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION
With heater having controlled warm-up time

24AUP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 5\%$ amp
Warm-up time (Average) 11 sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μ f
Cathode to all other electrodes 5 μ f
External conductive coating to ultor $\begin{cases} 2500 \text{ max. } \mu\text{f} \\ 1700 \text{ min. } \mu\text{f} \end{cases}$

Faceplate, Spherical Filterglass

Light transmission (Approx.) 74%

Phosphor (For curves, see front of this Section). . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68°

Electron Gun Type Requiring No Ion-Trap Magnet

Tube Dimensions:

Overall length $18\text{--}1\frac{1}{8}" \pm \frac{3}{8}"$

Greatest width $22\text{--}11\frac{1}{16}" \pm \frac{1}{8}"$

Greatest height $18\text{--}7\frac{1}{16}" \pm \frac{1}{8}"$

Diagonal $24" \pm \frac{1}{8}"$

Neck length $4\text{--}1\frac{1}{2}" \pm \frac{3}{16}"$

Radius of curvature of faceplate (External surface) . . $40"$

Screen Dimensions (Minimum):

Greatest width $21\text{--}7\frac{1}{16}"$

Greatest height $16\text{--}7\frac{7}{8}"$

Diagonal $22\text{--}13\frac{1}{16}"$

Projected area 332 sq. in.

Weight (Approx.) $32\text{--}1\frac{1}{2}$ lbs

Operating Position Any

Cap. Recessed Small Cavity (JEDEC No.J1-21)

Bulb J192A/B

Base Short Small-Shell Duodecal 6-Pin
(JEDEC Group 4, No.B6-203), or
Small-Shell Duodecal 6-Pin, Arrangement 1
(JEDEC Group 4, No.B6-63)

24AUP4

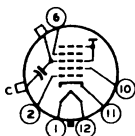


24AUP4

PICTURE TUBE

Basing Designation for BOTTOM VIEW12L

Pin 1-Heater
 Pin 2-Grid No.1
 Pin 6-Grid No.4
 Pin 10-Grid No.2
 Pin 11-Cathode
 Pin 12-Heater



Cap-Ultor
 (Grid No.3,
 Grid No.5,
 Collector)
 C-External
 Conductive
 Coating

GRID-DRIVE[▲] SERVICE

*Unless otherwise specified, voltage values are positive
 with respect to cathode*

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE. {20000 max. volts
 {12000* min. volts

GRID-No.4 (FOCUSING) VOLTAGE:

Positive value 1000 max. volts
 Negative value 500 max. volts

GRID-No.2 VOLTAGE. 500 max. volts

GRID-No.1 VOLTAGE:

Negative-peak value. 200 max. volts
 Negative-bias value. 140 max. volts
 Positive-bias value. 0 max. volts
 Positive-peak value. 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds 410 max. volts

After equipment warm-up period 180 max. volts

Heater positive with respect to cathode. 180 max. volts

Equipment Design Ranges:

*With any ultor voltage (E_{c5k}) between 12000 and 20000 volts
 and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.4 Voltage for
 focus[§] -75 to +400 volts

Grid-No.1 Voltage (E_{c1k}) for
 visual extinction of
 focused raster See Raster-Cutoff-Range Chart
 for Grid-Drive Service

Grid-No.1 Video Drive from

Raster Cutoff (Black Level):

White-level value

(Peak positive). Same value as determined for
 E_{c1k} except video drive is a
 positive voltage

Grid-No.4 Current. -25 to +25 μ a

▲, *, §: See next page.



24AUP4

PICTURE TUBE

24AUP4

Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet†.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	18000	volts
and grid-No.2 voltage of	300	volts
Grid-No.4 Voltage for focus . . .	-75 to +400	volts
Grid-No.1 Voltage for visual extinction of focused raster. .	-35 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value	35 to 72	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
---------------------------------------	----------	---------

CATHODE-DRIVE[®] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE.	{20000 max. 12000 [®] min.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	640 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive-peak value	200 max.	volts
Positive-bias value	140 max.	volts
Negative-bias value	0 max.	volts
Negative-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period. . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

*With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 12000
and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1})
between 225 and 640 volts*

Grid-No.4-to-Grid-No.1 Voltage for focus§.	-75 to +400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster	See Raster-Cutoff-Range Chart for Cathode-Drive Service	

▲, §, †, ■: See next page.



PICTURE TUBE

Cathode-to-Grid-No.1 Video		
Drive from Raster Cutoff		
(Black Level):		
White-level value		
(Peak negative)	Same value as determined for	
	E_{kg1} except video drive is a	
	negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable		
Centering Magnet†	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i>		
<i>No.1 voltage of</i>	<i>18000</i>	<i>volts</i>
<i>and grid-No.2-to-grid-</i>		
<i>No.1 voltage of</i>	<i>300</i>	<i>volts</i>
Grid-No.4-to-Grid-No.1		
Voltage for focus	-75 to +400	volts
Cathode-to-Grid-No.1 Volt-		
age for visual extinction		
of focused raster	33 to 60	volts
Cathode-to-Grid-No.1 Video		
Drive from Raster Cutoff		
(Black Level):		
White-level value	-33 to -60	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
---------------------------------------	----------	---------

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

* This value is a working design-center minimum. The equivalent absolute minimum ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 24AUP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor- or ultor-to-grid-No.1 voltage is never less than 11,000 volts.

§ The grid-No.4 voltage or grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor voltage (or ultor-to-grid-No.1 voltage) or grid-No.2 voltage (or grid-No.2-to-grid-No.1 voltage) within design ranges shown for these items.

† Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 1/2-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and other electrodes.

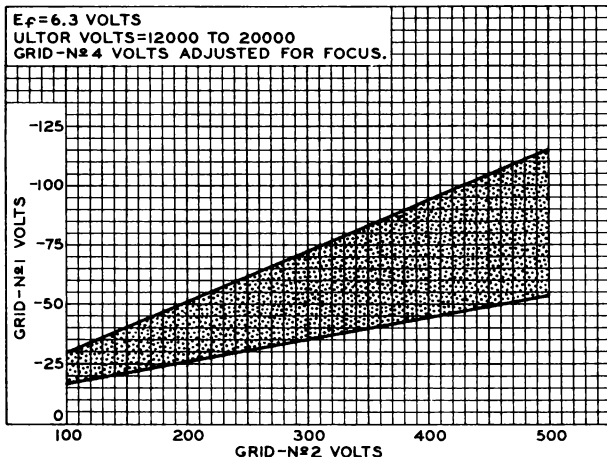
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section



24AUP4

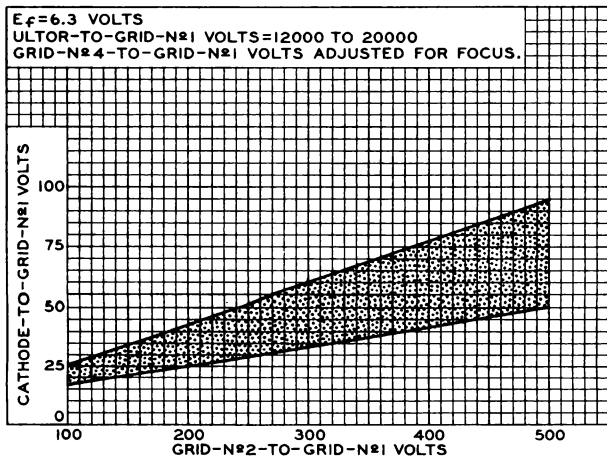
RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE

24AUP4



92CS-9919

CATHODE-DRIVE SERVICE

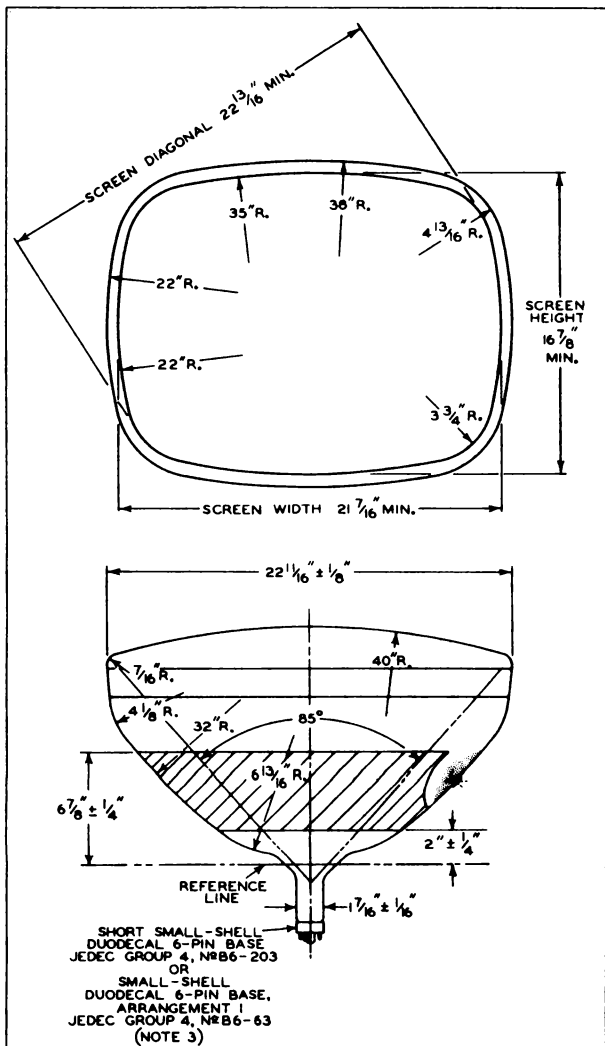


92CS-9918

24AUP4



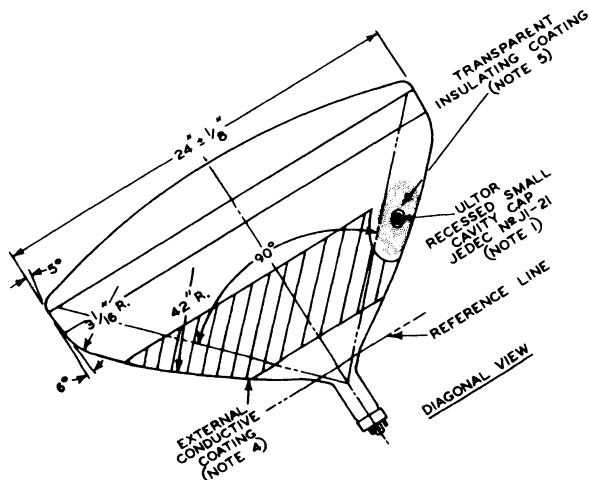
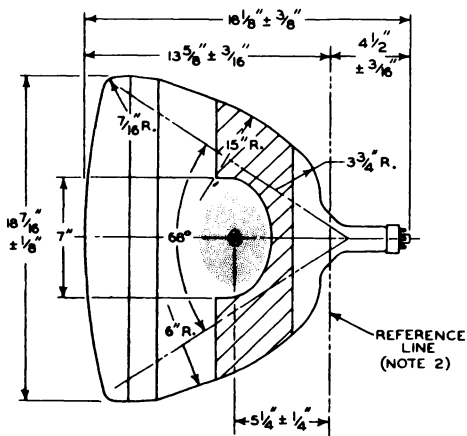
24AUP4 PICTURE TUBE





24AUP4 PICTURE TUBE

24AUP4

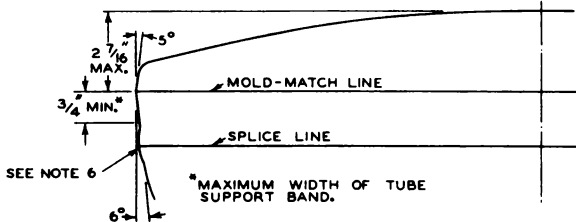


92CL-9917

24AUP4



24AUP4 PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC NO. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16$ " BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



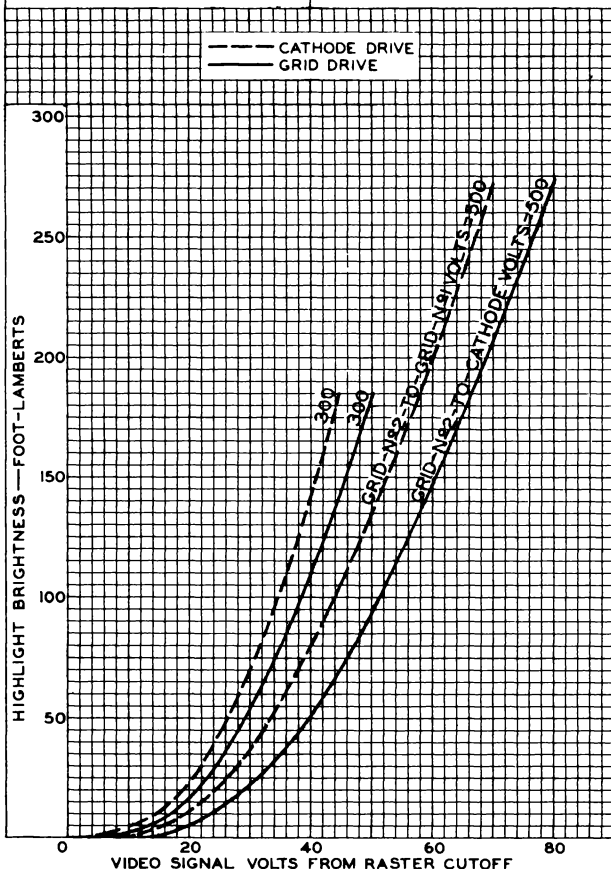
24AUP4

24AUP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N₂1 VOLTS = 16000
CATHODE BIASED POSITIVE WITH
RESPECT TO GRID N₂1 TO GIVE
FOCUSED RASTER CUTOFF,
RASTER FOCUSED
AT AVERAGE BRIGHTNESS.
RASTER SIZE = 21" x 16"

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
ULTOR VOLTS = 16000
GRID N₂1 BIASED NEGATIVE WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF,
RASTER FOCUSED
AT AVERAGE BRIGHTNESS.
RASTER SIZE = 21" x 16"



24AUP4



24AUP4

AVERAGE DRIVE CHARACTERISTICS

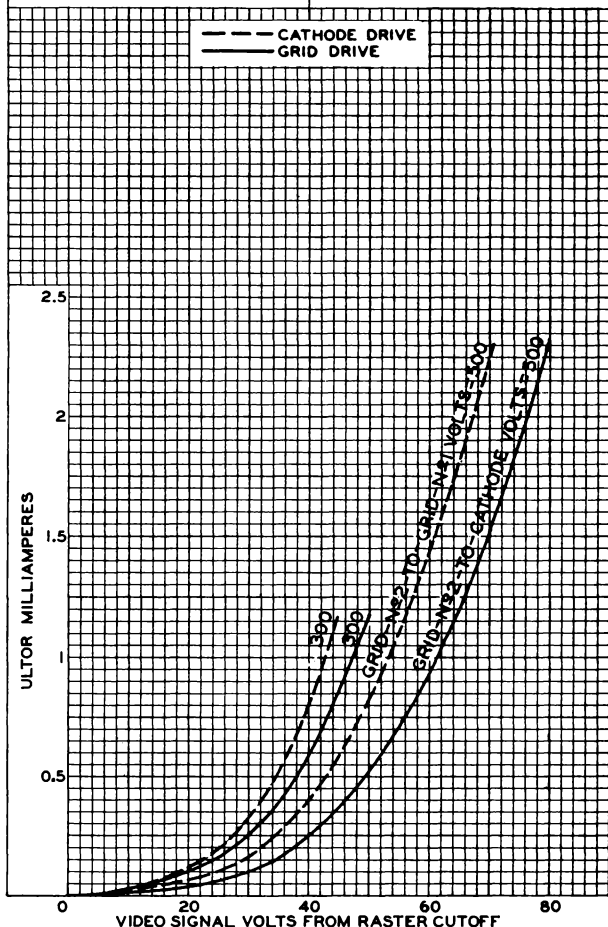
CATHODE-DRIVE SERVICE

 $E_f = 6.3$ VOLTSULTOR-TO-GRID-N₂ VOLTS =
12000 TO 20000CATHODE BIASED POSITIVE WITH
RESPECT TO GRID N₂ TO GIVE
FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE

 $E_f = 6.3$ VOLTS

ULTOR VOLTS = 12000 TO 20000

GRID N₂ BIASED NEGATIVE, WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.



24CP4-A KINESCOPE

24CP4-A

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp ←

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes 6 μf

Cathode to all other electrodes 5 μf

External conductive coating to ultor • $\begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 71% ←

Phosphor (For curves, see front of this section). .P4—Sulfide Type
Aluminized ←

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68° ←

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $21\text{--}1\frac{1}{8}" \pm \frac{3}{8}"$

Greatest width $22\text{--}11\frac{1}{16}" \pm \frac{1}{8}"$

Greatest height $18\text{--}7\frac{1}{16}" \pm \frac{1}{8}"$

Diagonal $24" \pm \frac{1}{8}"$

Screen Dimensions (Minimum):

Greatest width $21\text{--}1\frac{1}{4}"$

Greatest height $16\text{--}3\frac{1}{4}"$

Diagonal $22\text{--}5\frac{1}{8}"$ ←

Projected area 319 sq. in. ←

Weight (Approx.) 35 lbs

Mounting Position Any

Cap Recessed Small Cavity (JETEC No.J1-21)

Bulb J192

Base Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

Basing Designation for BOTTOM VIEW. 12N ←

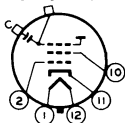
Pin 1 — Heater

Pin 2 — Grid No.1

Pin 10 — Grid No.2

Pin 11 — Cathode

Pin 12 — Heater



Cap — Ultor

(Grid No.3,
Collector)

C — External
Conductive
Coating

- The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 24CP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 24CP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

← Indicates a change.

24CP4-A



24CP4-A

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE	20000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds . . .	410 max.	volts
After equipment warm-up period. . . .	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c3k}) between 16000 and 20000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster.	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive		
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.2 Current	-15 to +15	μ amp
→ Focusing-Coil Current (DC) ^o .	$\left[\sqrt{\frac{E_{c3k}}{16000}} \times 108 \right] \pm 20\%$	ma
→ Ion-Trap Magnet Current	$\sqrt{\frac{E_{c3k}}{16000}} \times 30$	ma
(Average) ^{**}		
→ Minimum Field Strength of	$\sqrt{\frac{E_{c3k}}{16000}} \times 33$	gausses
PM Ion-Trap Magnet [§]		
Field Strength of Adjustable	0 to 8	gausses
Centering Magnet		

Examples of Use of Design Ranges:

With ultor voltage of		16000	18000	volts
→ and grid-No.2 voltage of		300	400	volts
→ Grid-No.1 Voltage for				
Visual Extinction of				
Focused Raster.	-28 to -72	-37 to -96		volts

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

*,^o,^{**},[§]: See next page.

→ Indicates a change.

NOV. 1, 1955

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



24CP4-A

KINESCOPE

24CP4-A

Grid-No.1 Video Drive from Raster Cutoff (Black Level):				
White-level value (Peak positive)	28 to 72	37 to 96	volts	←
Focusing-Coil Current (DC) . .	108 ± 20%	115 ± 20%	ma	←
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses	←

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
--	----------	---------

CATHODE-DRIVE[■] SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Design-Center Values:

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c2g1}) between 16000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts*

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of E_{c2g1}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of E_{c2g1}	volts

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 16000 volts.

0: See next page.

← Indicates a change.

NOV. 1, 1955

TUBE DIVISION

DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

24CP4-A



24CP4-A KINESCOPE

Grid-No.2 Current.	-15 to +15	μamp
→ Focusing-Coil Current (DC)°.	$\sqrt{\frac{E_{c391}}{16000}} \times 108 \pm 20\%$	ma
→ Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c391}}{16000}} \times 30$	ma
→ Minimum Field Strength of PM Ion-Trap Magnet§.	$\sqrt{\frac{E_{c391}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses
Examples of Use of Design Ranges:		
With ultor-to-grid-No.1 voltage of	16000	18000 volts
and grid-No.2-to-grid-No.1 voltage of	300	400 volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	25 to 58	34 to 78 volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	25 to 58	34 to 78 volts
Focusing-Coil Current (DC) . . .	108 ± 20%	115 ± 20% ma
Minimum Field Strength of PM Ion-Trap Magnet	33	35 gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (*See Dimensional Outline*). The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 21" x 16" picture size.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ For specimen PM ion-trap magnet, such as Heppner Model No.EN37, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

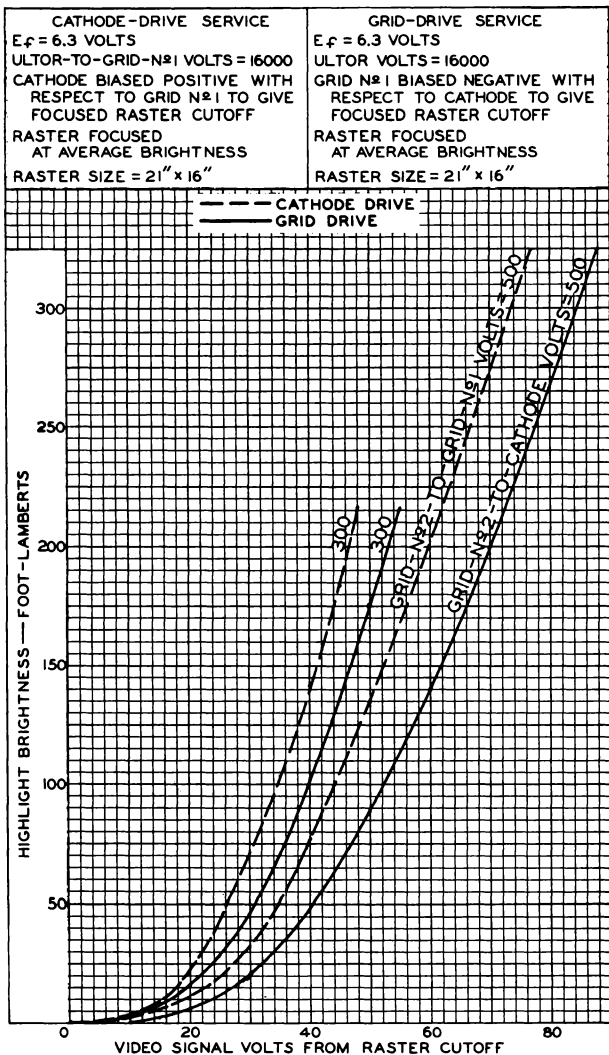
→ Indicates a change.



24CP4-A

24CP4-A

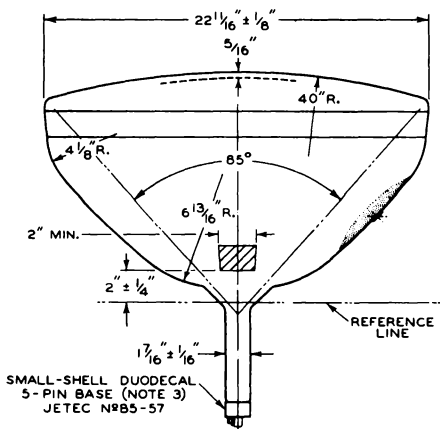
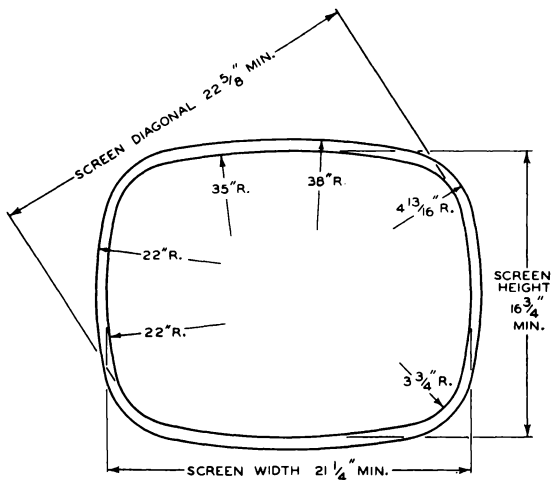
AVERAGE DRIVE CHARACTERISTICS



24CP4-A



24CP4-A KINESCOPE



NOV. 1, 1955

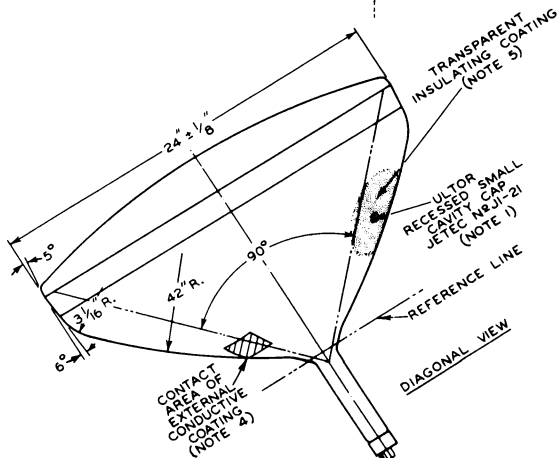
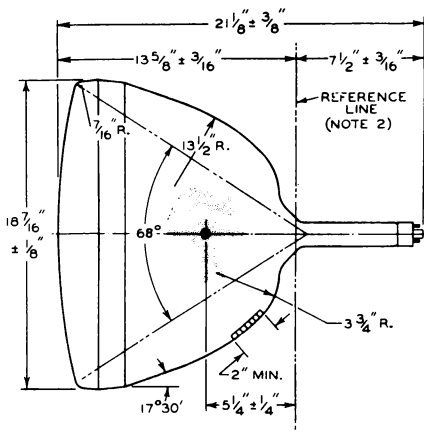
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8233RIA



24CP4-A KINESCOPE

24CP4-A



92CL-8233R1

NOV. 1, 1955

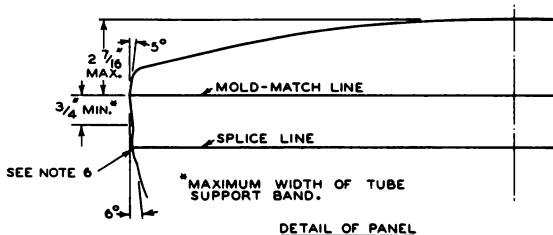
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8233R1B

24CP4-A



24CP4-A KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

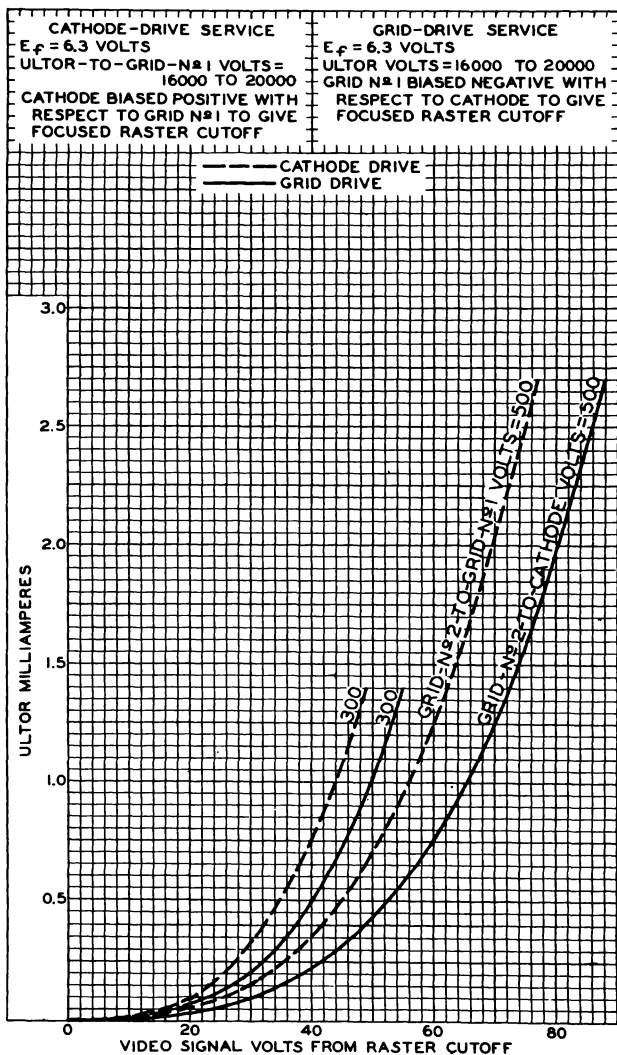
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8"$, BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16"$ BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



24CP4-A

24CP4-A

AVERAGE DRIVE CHARACTERISTICS



MAY 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8626



24DP4-A KINESCOPE

24DP4-A

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes. 6 μf

Cathode to all other electrodes. 5 μf

External conductive coating to ultor* $\begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}$ μf

Faceplate, Spherical Filterglass

Light transmission (Approx.) 71%

Phosphor (For curves, see front of this Section). . P4—Sulfide Type
Aluminized

Fluorescence White

Phosphorescence. White

Persistence. Short

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 68°

Ion-Trap Gun Requires External Single-Field Magnet

Tube Dimensions:

Overall length $21\text{--}1\frac{1}{8}" \pm \frac{3}{8}"$

Greatest width $22\text{--}11\frac{1}{16}" \pm \frac{1}{8}"$

Greatest height. $18\text{--}7\frac{1}{16}" \pm \frac{1}{8}"$

Diagonal $24" \pm \frac{1}{8}"$

Screen Dimensions (Minimum):

Greatest width $21\text{--}1\frac{1}{4}"$

Greatest height. $16\text{--}3\frac{1}{4}"$

Diagonal $22\text{--}5\frac{1}{8}"$

Projected area 319 sq. in.

Weight (Approx.) 35 lbs

Mounting Position. Any

Cap. Recessed Small Cavity (JETEC No.J1-21)

Bulb J192

Base Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

Basing Designation for BOTTOM VIEW 12L

Pin 1 — Heater

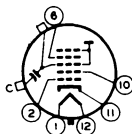
Pin 2 — Grid No.1

Pin 6 — Grid No.4

Pin 10 — Grid No.2

Pin 11 — Cathode

Pin 12 — Heater



Cap — Ultor

(Grid No.3,

Grid No.5,

Collector)

C — External
Conductive
Coating

*: See next page.

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TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

24DP4-A



24DP4-A

KINESCOPE

GRID-DRIVE[▲] SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR [•] VOLTAGE	20000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value [*]	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 16000^{*} and 20000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for		
Focus with Ultor		
Current of 100 μ amp.	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for		
Visual Extinction of		
Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from		
Raster Cutoff (Black Level):		
White-level value		
(Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.4 Current.	-25 to +25	μ amp
Grid-No.2 Current.	-15 to +15	μ amp
Ion-Trap Magnet Current		
(Average) ^{**}	$\sqrt{\frac{E_{c5k}}{16000}} \times 30$	ma
Minimum Field Strength of		
PM Ion-Trap Magnet [§]	$\sqrt{\frac{E_{c5k}}{16000}} \times 33$	gausses
Field Strength of Adjustable		
Centering Magnet	0 to 8	gausses

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

[•], ^{*}, [#], ^{**}, [§]: See next page.

NOV. 1, 1955

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



24DP4-A

24DP4-A KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	16000	18000	volts
and grid-No.2 voltage of	300	400	volts
Grid-No.4 Voltage for Focus with Ultor			
Current of 100 μ amp. . .	-65 to +350	-75 to +400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-37 to -96	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	37 to 96	volts
Minimum Field Strength of PM Ion-Trap Magnet . . .	33	35	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

CATHODE-DRIVE[®] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to grid No.1*

Maximum Ratings, Design-Center Values:

ULTOR [®] -TO-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds. . . .	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

• The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 24DP4-A, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 24DP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

• Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

#, **, §: See next page.

24DP4-A



24DP4-A

KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between
16000* and 20000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between
220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp. 0% to 2.6% of E_{c5g1} volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster. 8.5% to 19.4% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 8.5% to 19.4% of E_{c2g1} volts

Grid-No.4 Current.

-25 to +25

μ amp

Grid-No.2 Current.

-15 to +15

μ amp

Ion-Trap Magnet Current

(Average)**

$$\sqrt{\frac{E_{c5g1}}{16000}} \times 30$$

ma

Minimum Field Strength of

PM Ion-Trap Magnet§.

$$\sqrt{\frac{E_{c5g1}}{16000}} \times 33$$

gausses

Field Strength of Adjustable

Centering Magnet

0 to 8

gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1

voltage of

16000

18000

volts

and grid-No.2-to-grid-No.1

voltage of

300

400

volts

Grid-No.4-to Grid-No.1 Voltage

for Focus with Ultor

Current of 100 μ amp. 0 to 415 0 to 470 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster. 25 to 58 34 to 78 volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 25 to 58 34 to 78 volts

Minimum Field Strength of

PM Ion-Trap Magnet

33

35

gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

*, **, §: See next page.

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TUBE DIVISION

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



24DP4-A

KINESCOPE

24DP4-A

- # Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 16000 volts.
- ** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
- § For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gauss. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

DIMENSIONAL OUTLINE

for Type 24DP4-A is the same as that shown for Type
24CP4-A, except that the 24DP4-A has a Small-Shell
Duodecal 6-Pin Base

CURVES

for Type 24DP4-A are the same as those shown for
Type 24CP4-A



24YP4 KINESCOPE

24YP4

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 24YP4 is the same as the 24DP4-A except for the following items:

Direct Interelectrode Capacitances:

External conductive coating to ultor. . .	{ 1500 max.	$\mu\mu\text{f}$
	{ 1200 min.	$\mu\mu\text{f}$



27MP4

KINESCOPE

27MP4

RECTANGULAR METAL-SHELL TYPE
MAGNETIC FOCUSMETAL-BACKED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6	$\mu\mu\text{f}$
Cathode to All Other Electrodes	5	$\mu\mu\text{f}$

Faceplate, Spherical Frosted Filterglass

Light Transmission (Approx.) 66%

Phosphor (For curves, see front of this Section) . . P4--Sulfide Type

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angles (Approx.):

Diagonal 90°

Horizontal 85°

Vertical 69°

Ion-Trap Gun Requires External, Single-Field Magnet

Tube Dimensions:

Maximum Overall Length 22-3/16"

Greatest Diagonal 26-7/8" $\pm 1/4$ "Greatest Width 25-1/4" $\pm 3/16$ "Greatest Height 19-15/16" $\pm 3/16$ "

Screen Dimensions (Minimum):

Greatest Width 23-7/16"

Greatest Height 18-1/8"

Diagonal 25-1/16"

Weight (Approx.) 30 lbs

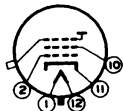
Mounting Position Any

Ultor® Terminal Metal-Shell Lip

Base Small-Shell Duodecal 5-Pin (JETEC No.85-57)

BOTTOM VIEW

Pin 1-Heater
Pin 2-Grid No.1
Pin 10-Grid No.2
Pin 11-Cathode
Pin 12-Heater



Metal-Shell
Lip—
Ultor
(Grid No.3,
Collector)

GRID-DRIVE[▲] SERVICE

*Unless otherwise specified, voltage values are positive
with respect to cathode*

Maximum Ratings, Design-Center Values:

ULTOR[®] VOLTAGE 18000 max. volts

•, ▲: See next page.

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TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

27MP4



27MP4 KINESCOPE

GRID-No.2 VOLTAGE	500 max. volts
GRID-No.1 VOLTAGE:	
Negative bias value	125 max. volts
Positive bias value	0 max. volts
Positive peak value	2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period	
not exceeding 15 seconds . . .	410 max. volts
After equipment warm-up period	180 max. volts
Heater positive with respect to cathode .	180 max. volts

Equipment Design Ranges:

With any ultor voltage (E_{c3k}) between 16000 and 18000 volts
and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster	12.3% to 24.3% of E_{c2k}	volts
---	-----------------------------	-------

Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
---	--	--

White-level value (Peak positive)	12.3% to 24.3% of E_{c2k}	volts
--------------------------------------	-----------------------------	-------

Grid-No.2 Current	-15 to +15	μ amp
-----------------------------	------------	-----------

Focusing-Coil Current (DC) ^{oo} .	$\left[\sqrt{\frac{E_{c3k}}{16000}} \times 110 \right] \pm 10\%$	ma
--	---	----

Field Strength of Single-Field Ion-Trap Magnet (Approx.) .	$\sqrt{\frac{E_{c3k}}{16000}} \times 50$	gausses
---	--	---------

Field Strength of Adjustable Centering Magnet	0 to 8	gausses
--	--------	---------

Examples of Use of Design Ranges:

<i>With ultor voltage (E_{c3k}) of</i>	<i>16000</i>	<i>16000</i>	<i>volts</i>
<i>and grid-No. voltage (E_{c2k}) of</i>	<i>300</i>	<i>400</i>	<i>volts</i>

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-37 to -73	-49 to -97	volts
---	------------	------------	-------

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
---	--	--	--

White-level value (Peak positive)	37 to 73	49 to 97	volts
--------------------------------------	----------	----------	-------

Focusing-Coil Current (DC) . .	$110 \pm 10\%$	$110 \pm 10\%$	ma
--------------------------------	----------------	----------------	----

Ion-Trap Magnet (Rated Strength)	50	50	gausses
-------------------------------------	----	----	---------

[▲] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

•,*,^{oo}: See next page.

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TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1



27MP4

KINESCOPE

27MP4

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

CATHODE-DRIVE[®] SERVICE*Unless otherwise specified, voltage values are positive with respect to grid No.1***Maximum Ratings, Design-Center Values:**

ULTOR[®]-TO-GRID-No.1 VOLTAGE 18000 max. volts
 GRID-No.2-TO-GRID-No.1 VOLTAGE 625 max. volts
 GRID-No.2-TO-CATHODE VOLTAGE 500 max. volts
 CATHODE-TO-GRID-No.1 VOLTAGE:

Positive bias value 125 max. volts
 Negative bias value 0 max. volts
 Negative peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds . . . 410 max. volts

After equipment warm-up period . . . 180 max. volts

Heater positive with respect to cathode. 180 max. volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c3g1}) between
 16000* and 18000 volts
 and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between
 220 and 620 volts

Cathode-to-Grid-No.1 Voltage

for Visual Extinction

of Focused Raster 11% to 19.7% of E_{c2g1} volts

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff

(Black Level):

White-level value

(Peak negative) 11% to 19.7% of E_{c2g1} voltsGrid-No.2 Current -15 to +15 μ amp

Focusing-Coil Current (DC)⁰⁰ . $\left[\sqrt{\frac{E_{c3g1}}{16000}} \times 110 \right] \pm 10\%$ ma

* The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 27MP4, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 27MP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

† Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

‡ Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 16000 volts.

⁰⁰; See next page.

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TUBE DEPARTMENT

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

27MP4



27MP4 KINESCOPE

Field Strength of Single-Field Ion-Trap Magnet (Approx.) . . . $\sqrt{\frac{E_{c3g1}}{16000}} \times 50$ gaussess

Field Strength of Adjustable Centering Magnet 0 to 8 gaussess

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage (E_{c3g1}) of 16000 16000 volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) of 300 400 volts

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster 33 to 59 44 to 79 volts

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):
White-level value (Peak negative) -33 to -59 -44 to -79 volts

Focusing-Coil Current (DC) . . 110 $\pm$ 10% 110 $\pm$ 10% ma

Ion-Trap Magnet (Rated Strength) 50 50 gaussess

Maximum Circuit Values:

Grid-No.1-Circuit Resistance 1.5 max. megohms

00 For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (see *Dimensional Outline*). The indicated current is for condition with combined bias voltage and video signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 23-7/16" x 18-1/8" picture area sharply focused at center of screen.

For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section.

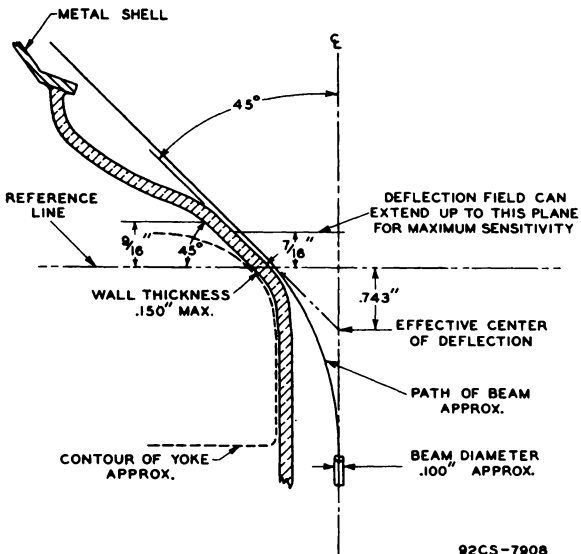


27MP4

KINESCOPE

27MP4

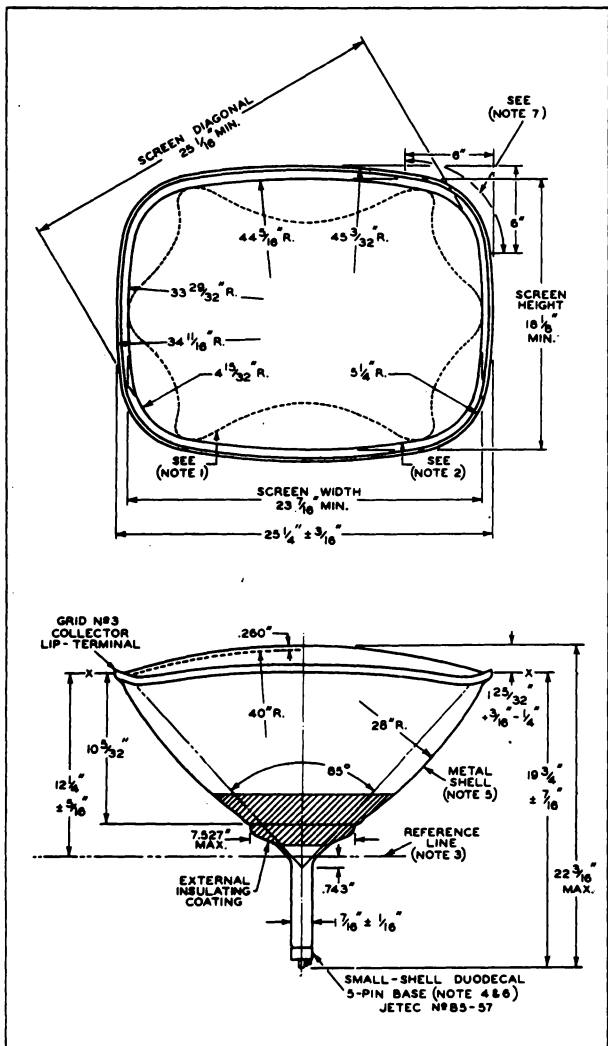
Shape of Neck-Funnel Section with Indication of Recommended Approximate Inside Contour of Yoke Based on Dimensions of Reference-Line Gauge (JETEC No. 116) Shown at Front of this Section.



27MP4



27MP4 KINESCOPE



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TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

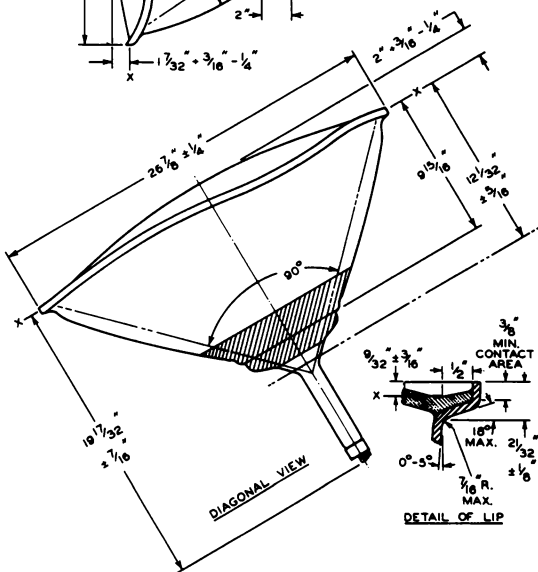
CE-7924A



Technical drawing of a mechanical part, likely a propeller or fan blade, showing dimensions and angles. The drawing includes a side view and a cross-sectional view. Dimensions are given in inches and fractions of an inch. Angles are specified as $20^{\circ} R$ and 69° . A shaded area indicates a specific material or section.

Dimensions and Angles:

- Top horizontal dimension: $20 \frac{5}{16}'' \pm \frac{7}{16}''$
- Second horizontal dimension from left: $12 \frac{13}{16}'' \pm \frac{5}{16}''$
- Third horizontal dimension from left: $10 \frac{23}{32}''$
- Right horizontal dimension: $7 \frac{1}{2}'' \pm \frac{3}{16}''$
- Left vertical dimension: $19 \frac{15}{16}'' \pm \frac{3}{16}''$
- Angle: $20^{\circ} R$
- Angle: 69°
- Bottom horizontal dimension: $1 \frac{7}{32}'' + \frac{3}{16}'' - \frac{1}{4}''$
- Bottom right dimension: $2'' \pm \frac{3}{16}'' - \frac{1}{4}''$
- Small horizontal dimension near the tip: $\frac{3}{4}''$
- Small horizontal dimension near the base: $2''$



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CE-7924B

27MP4



27MP4 KINESCOPE

NOTE 1: APPROXIMATE BOUNDARY OF SPHERICAL SURFACE HAVING 40" RADIUS. OUTSIDE THIS BOUNDARY, THE CURVATURE OF THE SURFACE IS BLENDED INTO THE RIM. (SEE NOTE 2).

NOTE 2: FACEPLATE SHAPE AT PERIMETER OF SCREEN CONFORMS TO SURFACE OF SPHERE HAVING 50" RADIUS.

NOTE 3: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 4: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING A DIAMETER OF 3-1/4".

NOTE 5: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

NOTE 6: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.

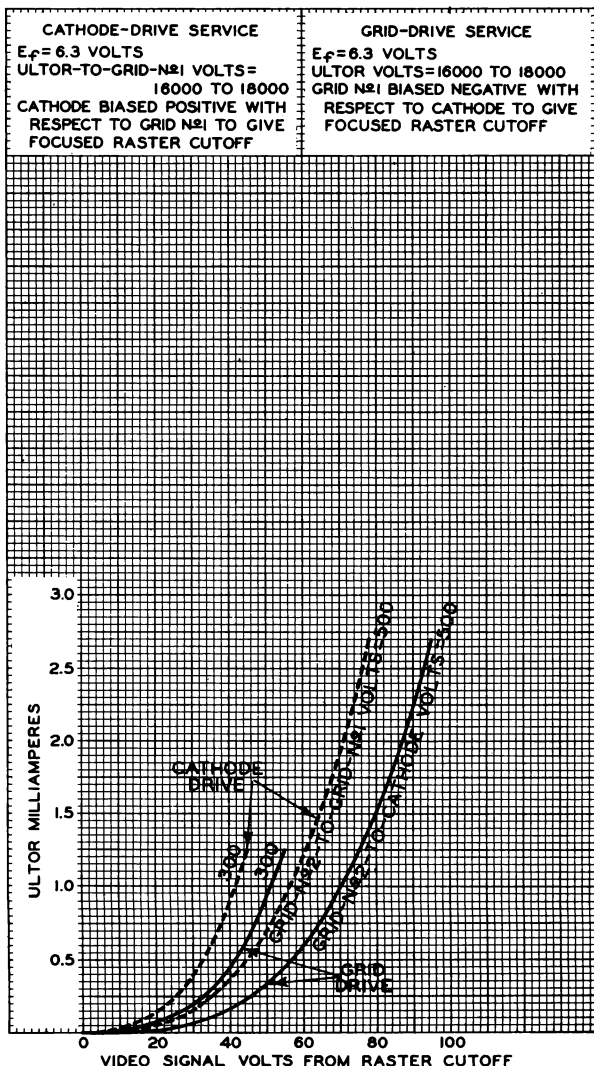
NOTE 7: SUPPORT TUBE IN LIP REGION ONLY AT CORNERS WITHIN THIS SPACE.



27MP4

27MP4

AVERAGE DRIVE CHARACTERISTICS

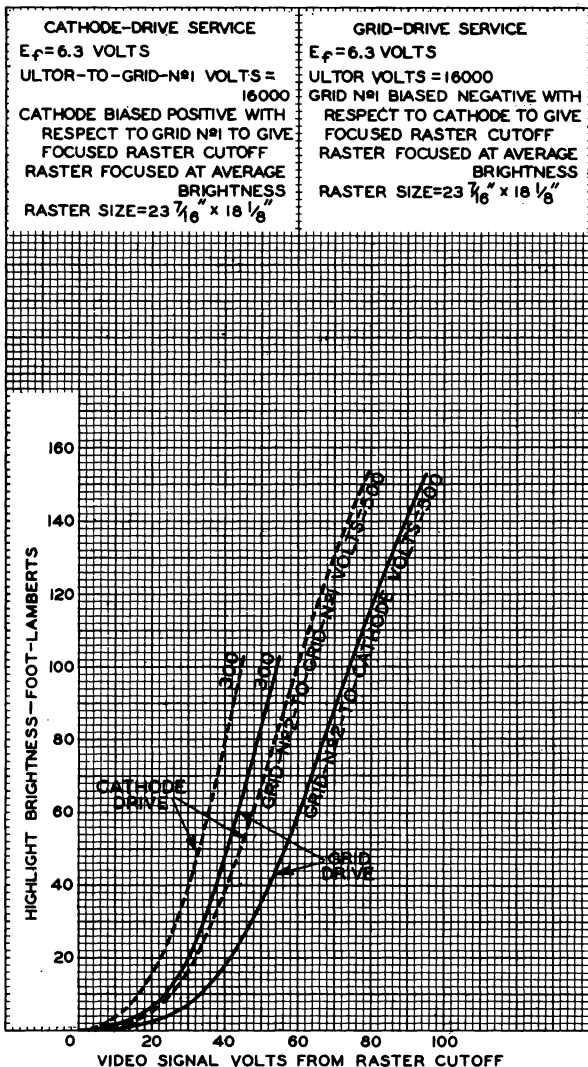


27MP4



27MP4

AVERAGE DRIVE CHARACTERISTICS



MAR. 26, 1953

TUBE DEPARTMENT

92CM-7900

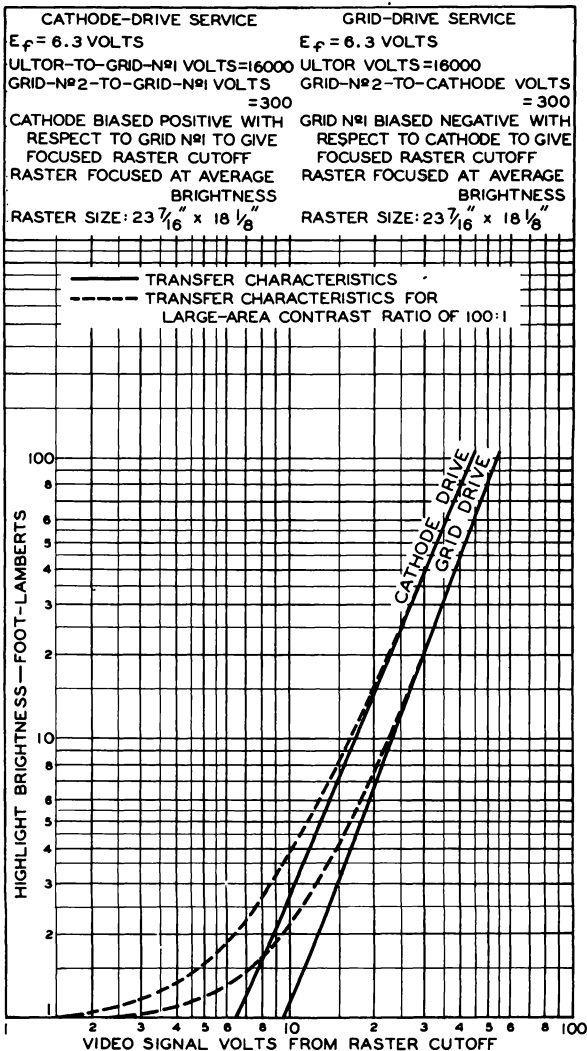
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



27MP4

27MP4

AVERAGE DRIVE CHARACTERISTICS



MAR. 30, 1953

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7902



902-A

902-A

HIGH-VACUUM CATHODE-RAY TUBE*Supersedes Type 902***General:**

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts

Current. 0.6 amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. 7.5 μf DJ₁ to All Other Electrodes. 8.5 μf DJ₄ to All Other Electrodes. 6.0 μf

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence. Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

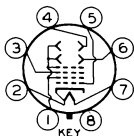
Overall Length $7-7/16" \pm 3/16"$ Greatest Diameter of Bulb. $2" \pm 1/16"$ Minimum Useful Screen Diameter $1-3/4"$

Mounting Position. Any

Base Medium Shell Octal 8-Pin

Basing Designation for BOTTOM VIEW 8CD

Pin 1—Grid No.2,
Anode No.2,
Deflecting
Electrode DJ₂,
Deflecting
Electrode DJ₃



Pin 2—Heater,
Cathode

Pin 3—Anode No.1
Pin 4—Deflecting
Electr. DJ₁
Pin 5—Grid No.1
Pin 6—Deflecting
Electr. DJ₄
Pin 7—Heater
Pin 8—No Connection

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 3. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 1 does not exceed 10° .

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is $90^\circ \pm 40^\circ$.

Maximum Ratings, Absolute Values:

ANODE—No.2 & GRID No.2 VOLTAGE. 660 max. volts

ANODE—No.1 VOLTAGE. 330 max. volts

GRID—No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative Value. 125 max. volts

Positive Value. 0 max. volts

PEAK VOLTAGE BETWEEN ANODE No.2 AND

DEFLECTING ELECTRODE DJ₁ OR DJ₄ 385 max. volts



HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Typical Operation:

Anode No.2 & Grid No.2 Voltage★	400	600	volts
Anode No.1 Voltage for Focus			
at 75% of Grid-No.1 Voltage for Cutoff •	100	150	volts
Grid-No.1 Volt. for Visual Cutoff#	-40	-60	volts
Max. Anode-No.1 Current			
Range▲	Between -50 and +10		μamp.

Deflection Sensitivity:

DJ ₁ and DJ ₂	0.273	0.183	mm/v dc
DJ ₃ and DJ ₄	0.326	0.217	mm/v dc

Deflection Factor:**

DJ ₁ and DJ ₂	93	139	v dc/in.
DJ ₃ and DJ ₄	78	117	v dc/in.

★ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 400 volts.

● Individual tubes may require between +20% and -35% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to ± 50% of these values.

▲ See curve for average values.

** Individual tubes may vary from these values by ± 20%.

Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ₁ and DJ₂. Suitable test conditions are: anode-No.2 voltage, 600 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ₁ and DJ₄, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

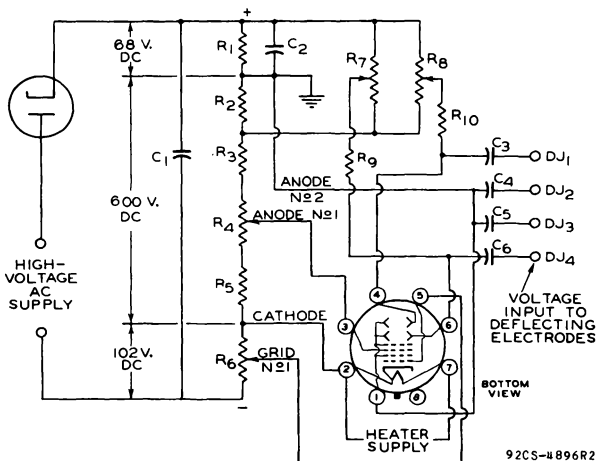
Grid-No.1-Circuit Resistance	1.5 max. megohms
Impedance of Any Deflecting-Electrode	
Circuit at Heater-Supply Frequency	1.0 max. megohm
Resistance in Any Deflecting-	
Electrode Circuit▲▲	5.0 max. megohms

▲▲ It is recommended that both deflecting-electrode-circuit resistances be approximately equal.



902-A

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μ f
C2: 1.0 μ f
C3 C4 C5 C6: 0.05- μ f Blocking
Capacitors*
R1 R2: 1.0 Megohm
R3: 1.3 Megohms

R4: 1-Megohm Potentiometer
R5: 0.3 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 2-Megohm Potentiometer
R9 R10: 2 Megohms

* When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

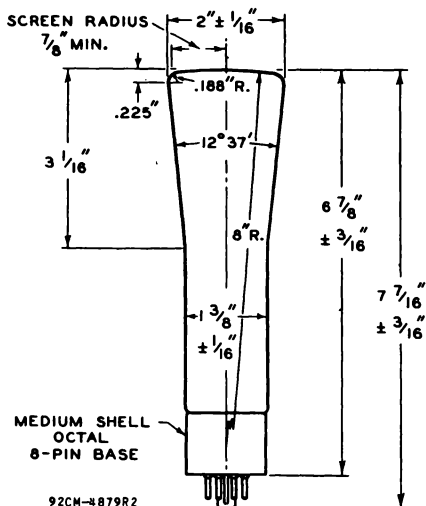
The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

902-A



902-A

HIGH-VACUUM CATHODE-RAY TUBE



☐ OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM PERPENDICULAR
ERECTED AT CENTER OF BOTTOM OF BASE



902-A

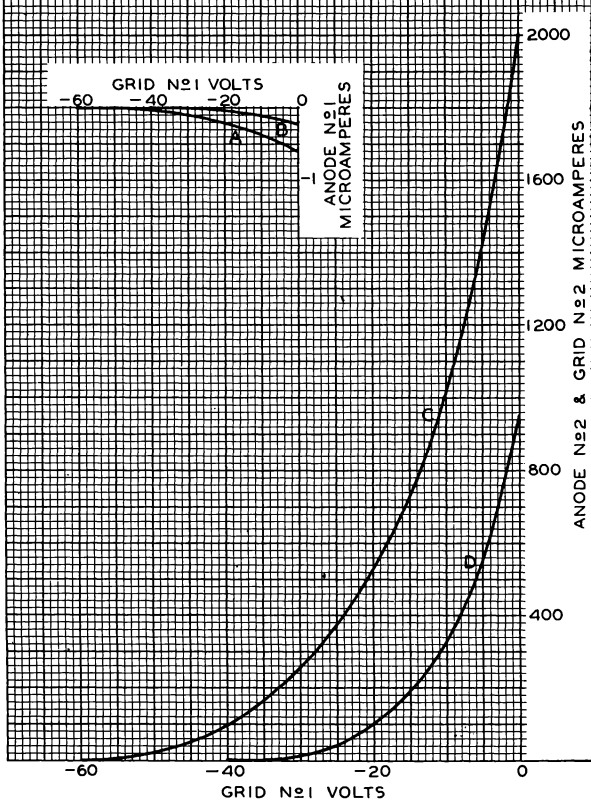
902-A

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

ANODE N°1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE N°2 & GRID N°2 VOLTS
A	ANODE N°1	600
B	ANODE N°1	400
C	ANODE N°2 & GRID N°2	600
D	ANODE N°2 & GRID N°2	400



APR. 13, 1945

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4895R1



908-A

908-A

OSCILLOGRAPH TUBE

Supersedes Type 908

General:

Heater, for Unipotential Cathode:

Voltage $2.5 \pm 10\%$ ac or dc volts

Current 2.1 amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 9.0 μf DJ₁ to All Other Electrodes 8.5 μf DJ₃ to All Other Electrodes 6.5 μf

Phosphor (For Curves, see front of this Section) No.5

Fluorescence Blue

Persistence Very Short

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length $11\frac{1}{2}'' \pm \frac{3}{8}''$ Greatest Diameter of Bulb $3'' \pm \frac{1}{16}''$ Minimum Useful Screen Diameter $2\frac{3}{4}''$

Mounting Position Any

Base Medium 7-Pin

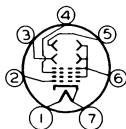
Basing Designation for BOTTOM VIEW 7CE

Pin 1-Heater

Pin 2-Grid No.1

Pin 3-Deflecting
Electrode DJ₃

Pin 4-Anode No.1

Pin 5-Deflecting
Electrode DJ₁

Pin 6-Grid No.2,

Anode No.2,

Deflecting

Electr. DJ₂,

Deflecting

Electr. DJ₄

Pin 7-Heater,

Cathode

*DJ₁ and DJ₂ are nearer the screen**DJ₃ and DJ₄ are nearer the base*

With DJ₂ positive with respect to DJ₁, the spot is deflected toward pin 1. With DJ₄ positive with respect to DJ₃, the spot is deflected toward pin 6.

The angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 6 does not exceed 10° .

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is $90^\circ \pm 3^\circ$.

Maximum Ratings, Design-Center Values:

ANODE-No.2 & GRID No.2 VOLTAGE 1500 *max.* voltsANODE-No.1 VOLTAGE 1000 *max.* volts

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:

Negative Value 125 *max.* voltsPositive Value 0 *max.* voltsPEAK VOLTAGE BETWEEN ANODE No.2 AND
DEFLECTING ELECTRODE DJ₁ OR DJ₃ 500 *max.* volts

908-A



908-A

OSCILLOGRAPH TUBE

(continued from preceding page)

Typical Operation:

Anode No.2 & Grid No.2 Voltage* . . 1000 1500 . . . volts

Anode No.1 Voltage for Focus

at 75% of Grid-No.1 Volt-

age for Cutoff* . . 287 430 . . . volts

Grid-No.1 Volt. for Visual Cutoff#. -33 -50 . . . volts

Max. Anode-No.1 Current Range[▲]. Between -50 and +10⁺ μ amp.

Deflection Sensitivity:

DJ1 and DJ2 0.334 0.223 . . mm/v dc

DJ3 and DJ4 0.348 0.233 . . mm/v dc

Deflection Factor:**

DJ1 and DJ2 76 114 . . v dc/in.

DJ3 and DJ4 73 109 . . v dc/in.

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1000 volts.

● Individual tubes may require between +29% and -44% of the values shown with grid-No.1 voltages between zero and cutoff.

▲ Visual extinction of stationary focused spot. Supply should be adjustable to $\pm$ 50% of these values.

▲ See curve for average values.

** Individual tubes may vary from these values by $\pm$ 20%.

Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ1 and DJ2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ1 and DJ3, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

Grid-No.1 Circuit Resistance 1.5 max. megohms

Impedance of Any Deflecting-Electrode

Circuit at Heater-Supply Frequency 1.0 max. megohm

Resistance in Any Deflecting-

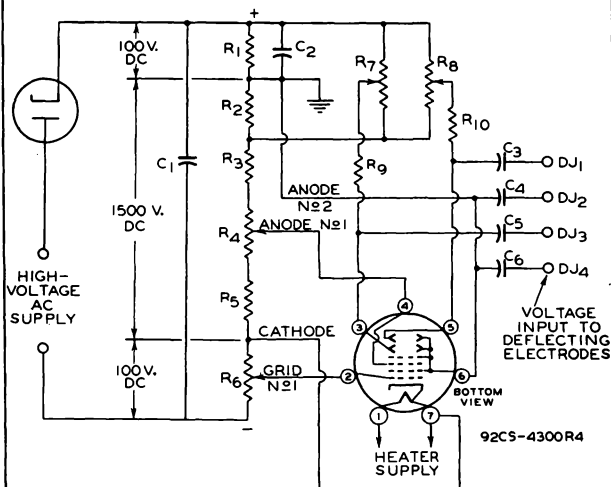
Electrode Circuit^{▲▲} 5.0 max. megohms

▲▲ It is recommended that both deflecting-electrode-circuit resistances be approximately equal.



908-A

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μ f
C2: 1.0 μ f
C3 C4 C5 C6: 0.05- μ f Blocking
Capacitors*
R1 R2: 1.5 Megohms
R3: 4 Megohms

R4: 2-Megohm Potentiometer
R5: 1.0 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 3-Megohm Potentiometer
R9 R10: 2-Megohms

* When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

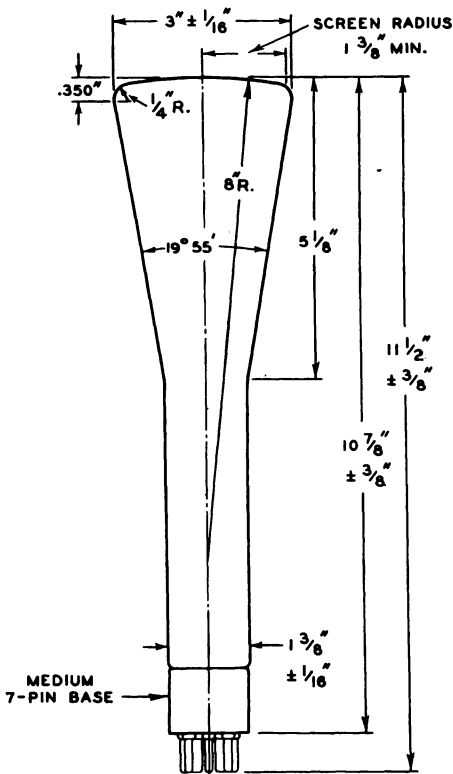
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908-A



908-A

OSCILLOGRAPH TUBE



92CM-4284R7

CL OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM PERPENDICULAR
ERECTED AT CENTER OF BOTTOM OF BASE



908-A

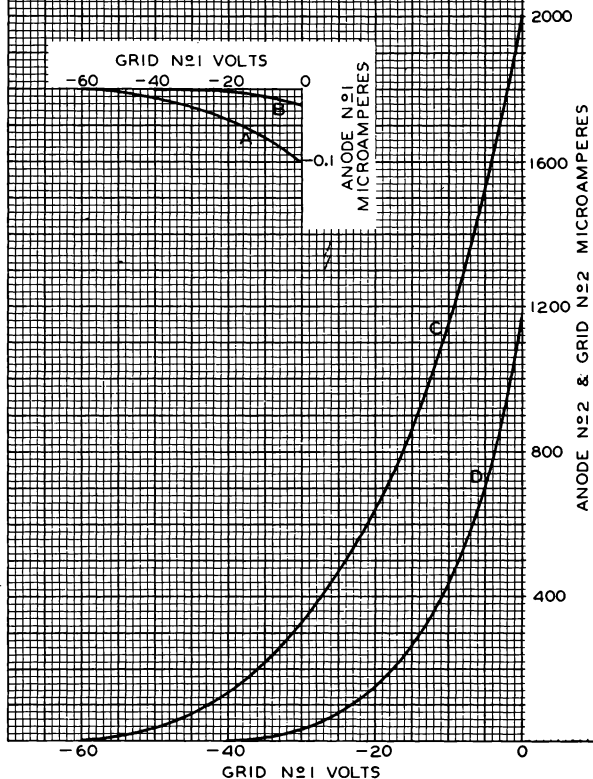
908-A.

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTS

ANODE N°1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE N°2 & GRID N°2 VOLTS
A	ANODE N°1	1500
B	ANODE N°1	1000
C	ANODE N°2 & GRID N°2	1500
D	ANODE N°2 & GRID N°2	1000



APR. 18, 1945

TUBE DIVISION

92CM-5415R5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



912

9/12

HIGH-VACUUM CATHODE-RAY TUBE

HIGH-INTENSITY ELECTROSTATIC-DEFLECTION TYPE

WITH 5" MEDIUM-PERSISTENCE SCREEN FOR OSCILLOGRAPHIC USE

Heater	Coated Unipotential Cathode	
Voltage	2.5	a-c or d-c volts
Current	2.1	amp.

Fluorescent Screen:

Material	Phosphor No.1
Pattern Color	Greenish

Direct Interelectrode Capacitances:

Grid to all other electrodes	14 max.	μf
DJ ₁ to DJ ₂	3 max.	μf
DJ ₃ to DJ ₄	1.5 max.	μf

Overall Length16-1/2" $\pm$ 3/8"**Maximum Diameter**

5-1/4" + 1/16" - 3/32"

Bulb

J-42

Caps:

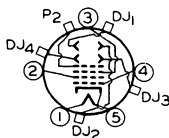
Anode No.2	Medium Metal
Deflecting Electrodes (Four)	Small Metal

Base

Medium 5-Pin Micanol

BOTTOM VIEW

Pin 1 - Heater
 Pin 2 - Grid No.2
 Pin 3 - Anode No.1
 Pin 4 - Grid No.1
 Pin 5 - Heater,
 Cathode
 Single Medium Cap -
 Anode No.2
 Cap } Deflecting
 Over } Electrode
 Pin 3 } DJ₁



Cap	}	Deflecting
Over		
Pins	}	Electrode
1 & 5		
Cap	}	Deflecting
Over		
Pin 2	}	Electrode
Cap		
Over	}	Deflecting
Pin 4		
	}	Electrode
	}	Electrode

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS*Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts*

High-Voltage Electrode (Anode #2) Voltage	15000 max.	volts
Focusing Electrode (Anode #1) Voltage	4500 max.	volts
Accelerating Electrode (Grid #2) Voltage	250 max.	volts
Control Electrode (Grid #1) Voltage	Never positive	
Grid Voltage for Current Cut-off *	-125 approx.	volts
Peak Voltage Between Anode #2 and any deflecting electrode	7000 max.	volts

Typical Operation:

Heater Voltage	2.5	2.5	2.5	volts
Anode #2 Voltage	5000	10000	15000	volts
Anode #1 Voltage	1000	2000	3000	approx. volts
Grid #2 Voltage	250	250	250	volts
Grid #1 Voltage	Adjusted to give suitable luminous spot			
Deflection Sensitivity:				
DJ ₁ to DJ ₂	0.083	0.041	0.028	mm/volt d.c.
DJ ₃ to DJ ₄	0.102	0.051	0.034	mm/volt d.c.

* With maximum voltages on Anode #1 and Grid #2.

← indicates a change.

JUNE 20, 1947

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

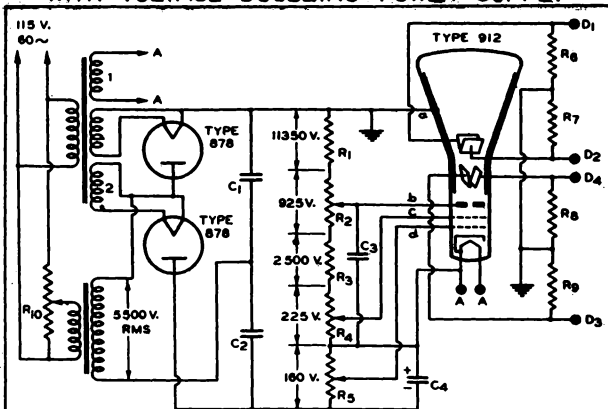
DATA

912



912

TYPICAL OSCILLOGRAPH CIRCUIT USING THE 912 WITH VOLTAGE-DOUBLING POWER SUPPLY



$C_1, C_2 = 0.5 \mu f, 10000 \text{ V.}$

$C_3 = 1.0 \mu f, 5000 \text{ V.}$

$C_4 = 16 \mu f, 200 \text{ V.}$

$R_1 = 2.5 \text{ MEGOHMS, 75-WATT}$

$R_2 = 0.2 \text{ MEGOHM, 10-WATT}$

$R_3 = 0.55 \text{ MEGOHM, 20-WATT}$

$R_4 = 50000 \text{ OHMS, 2-WATT}$

$R_5 = 35000 \text{ OHMS, 2-WATT}$

$R_6, R_7, R_8, R_9 = 2 \text{ TO } 5 \text{ MEGOHMS}$

$R_{10} = 100 \text{ OHMS, 800-WATT}$

a = ANODE No. 2

b = ANODE No. 1

c = GRID No. 2

d = GRID No. 1

NOTE: AS THE TOTAL VOLTAGE ACROSS THE BLEEDER IS REDUCED BY MEANS OF R_{10} , THE ELECTRODE VOLTAGES ARE REDUCED IN CORRECT PROPORTION, EXCEPT FOR GRID NO. 2 VOLTAGE; THIS MAY HAVE TO BE READJUSTED BY THE USE OF DIFFERENT VALUES FOR R_1 AND R_2 , THEIR TOTAL RESISTANCE BEING KEPT THE SAME. CONDENSERS C_1 AND C_2 CAN BE OMITTED IF GRID-VOLTAGE SWITCHING (FOR HIGH-SPEED PHOTOGRAPHY) IS NOT CONTEMPLATED. FILAMENT WINDINGS NOS. 1 AND 2 SHOULD BE INSULATED FOR 20000 VOLTS.

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92C-4621R1

FLUORESCENT-SCREEN CHARACTERISTICS

CURVES SHOWING THE AVERAGE CHARACTERISTICS, SPECTRAL ENERGY CHARACTERISTIC, AND PERSISTENCE CHARACTERISTIC OF PHOSPHOR No. 1 ARE SHOWN AT THE BEGINNING OF THIS SECTION.

← Indicates a change.

AUG. 15, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

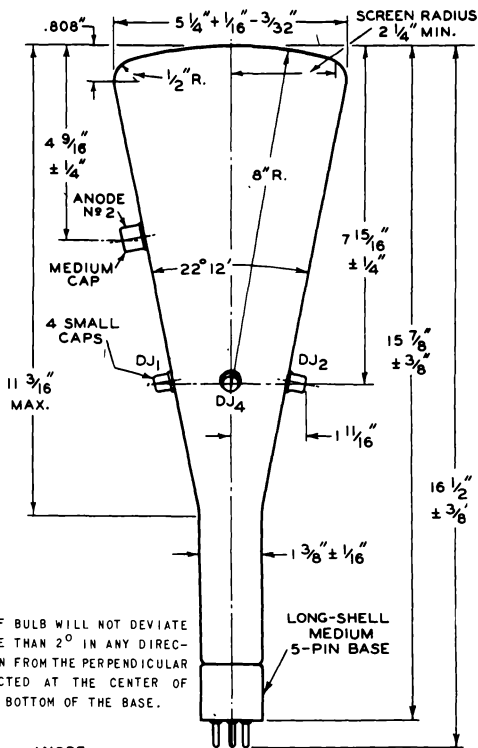
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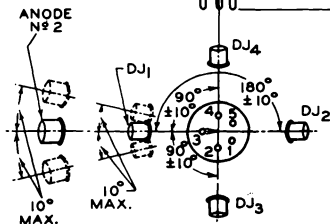
912

HIGH-VACUUM CATHODE-RAY TUBE

9/12



Q OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.



92CM-4619R3

BOTTOM VIEW OF TUBE

DJ₁ AND DJ₂ ARE NEARER THE SCREEN; DJ₃ AND DJ₄ ARE NEARER THE BASE. ANGLE BETWEEN DJ₁ - DJ₂ TRACE AND DJ₃ - DJ₄ TRACE IS $90^\circ \pm 6^\circ$.

AUG. 15, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

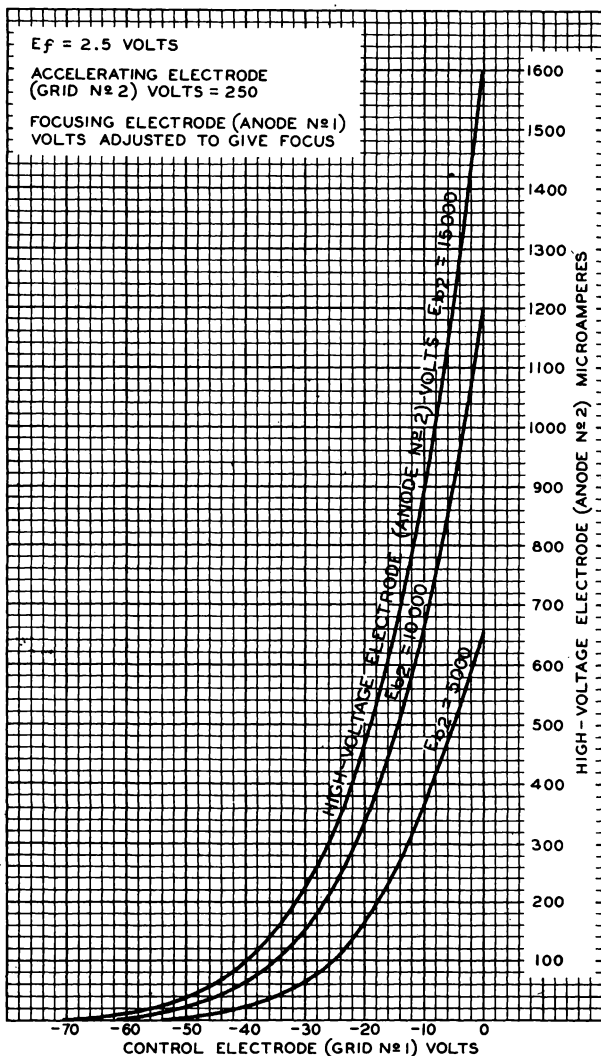
CE-4619R3

912



912

AVERAGE CHARACTERISTICS



AUG. 23, 1946

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-4623



913

9/13

HIGH-VACUUM CATHODE-RAY TUBE

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.6	amp.
Focus	Electrostatic	
Deflection	Electrostatic	
Electrodes DJ ₁ and DJ ₂ (upper): nearest to screen		
Electrodes DJ ₃ and DJ ₄ (lower): nearest to base		
DJ ₁ is on the same side of tube as pins No.2 and No.4		
DJ ₃ is on the same side of tube as pins No.2 and No.8		
Phosphor	No.1	
Fluorescence	Green	
Persistence	Medium	
Direct Interelectrode Capacitances:		
Control Electrode (Grid) to All Other Electrodes	8	μf
Deflecting Electrode DJ ₁ to Deflecting Electrode DJ ₂	2.5	μf
Deflecting Electrode DJ ₃ to Deflecting Electrode DJ ₄	2.5	μf
Maximum Overall Length	4-3/4"	
Maximum Diameter	1-5/8"	
Bulb	Metal Shell, MT-10	
Base	Small Wafer Octal 8-Pin	

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS*Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts*

High-Voltage Electrode (Anode No.2) Volt.	500 max.	volts
Focusing Electrode (Anode No.1) Volt.	200 max.	volts
Control Electrode (Grid) Volt.	Never positive	
Peak Voltage Between Anode No.2 and Any Deflecting Electrode	250 max.	volts
Grid Circuit Resistance	1.5 max.	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 max.	megohm

Typical Operation:

Anode No.2 Voltage	250	500	volts
Anode No.1 Voltage [□]	50	100	approx. volts
Grid Voltage [○]	Adjusted to give suitable luminous spot		

Deflection Sensitivity:

Electrodes DJ ₁ & DJ ₂	0.15	0.07	mm/volt d.c.
Electrodes DJ ₃ & DJ ₄	0.21	0.10	mm/volt d.c.

NOTE 1: Brilliance and definition decrease with decreasing anode voltages. In general the anode No.2 voltage should not be less than 250 volts.

NOTE 2: The d-c potential of each deflecting electrode is maintained essentially equivalent to that of anode No.2 by connecting resistors having values not greater than 10 megohms between each deflecting electrode and anode No.2. This arrangement by suitable choice of resistor values minimizes pattern distortion and pattern drift resulting from unbalanced potentials on the deflecting electrodes. The smaller the resistor values, the less the distortion for a given beam current.

□, ○: See next page.

← Indicates a change.

Jan. 30, 1942

RCA RADOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

DATA



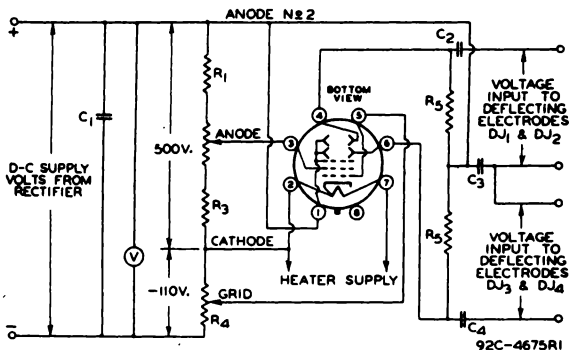
HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

- □ Supply should be adjustable to $\pm 30\%$ of the value shown.
 → ○ Approximately 80% of Anode No.1 voltage is required for current cut-off when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.

Characteristic Curves of phosphor No.1 are shown at the beginning of this section.

TYPICAL OSCILLOGRAPH CIRCUIT



C_1 = FILTER CONDENSER
 C_2, C_3, C_4 = SEE NOTE 3

$R_1 + R_2 + R_3 + R_4$ = BLEEDER POTENTIOMETER

R_1 = 0.200 MEGOHM

R_2 = 0.050 MEGOHM

R_3 = 0.030 MEGOHM

R_4 = 0.050 MEGOHM

R_5 = SEE NOTE 2

AT END OF DATA

V = VOLTMETER

NOTE 3: When the cathode or the negative end of the cathode-ray high-voltage supply is grounded, blocking condensers C_2, C_3 , and C_4 should have a high voltage rating. When anode No.2 is grounded, C_3 may be omitted and C_2 and C_4 may be low-voltage condensers.

For d-c amplifier service, the deflecting electrodes should be coupled direct to the output of the amplifier by omitting the blocking condensers. In addition, it will usually be preferable to remove the associated deflecting electrode resistor in order to minimize the loading effect of the resistor on the d-c amplifier. With the resistor removed, it is essential, in order to minimize spot defocusing, that anode No.2 be returned to some point in the d-c amplifier circuit such that the potential difference between anode No.2 and the average voltage across the deflecting electrodes will be as low as possible.

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

← Indicates a change.

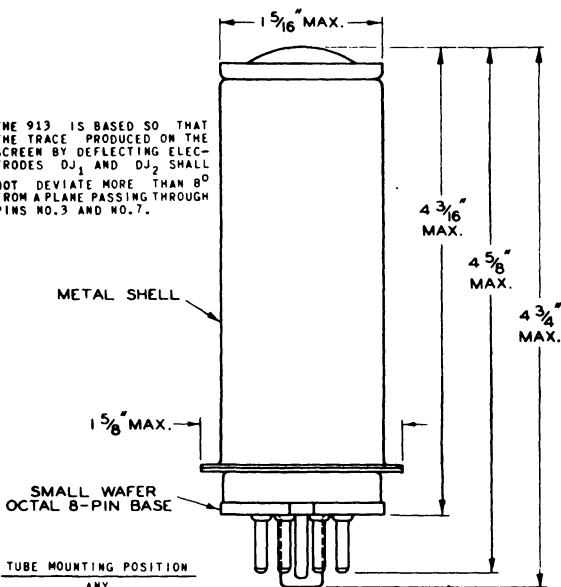


913

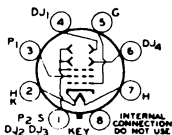
9/3

HIGH-VACUUM CATHODE-RAY TUBE

THE 913 IS BASED SO THAT THE TRACE PRODUCED ON THE SCREEN BY DEFLECTING ELECTRODES DJ_1 AND DJ_2 SHALL NOT DEVIATE MORE THAN 8° FROM A PLANE PASSING THROUGH PINS NO.3 AND NO.7.

BOTTOM VIEW OF SOCKET CONNECTIONS

DJ_1 to DJ_4 = Deflecting Electrodes
 P_2 = Anode No.2
 P_1 = Anode No.1
 G_1 = Grid No.2
 G_2 = Control (Grid No.1) Electrodes
 H_1 = Heater
 H = Heater
 K = Cathode
 S = Shell
 NC = No Connection

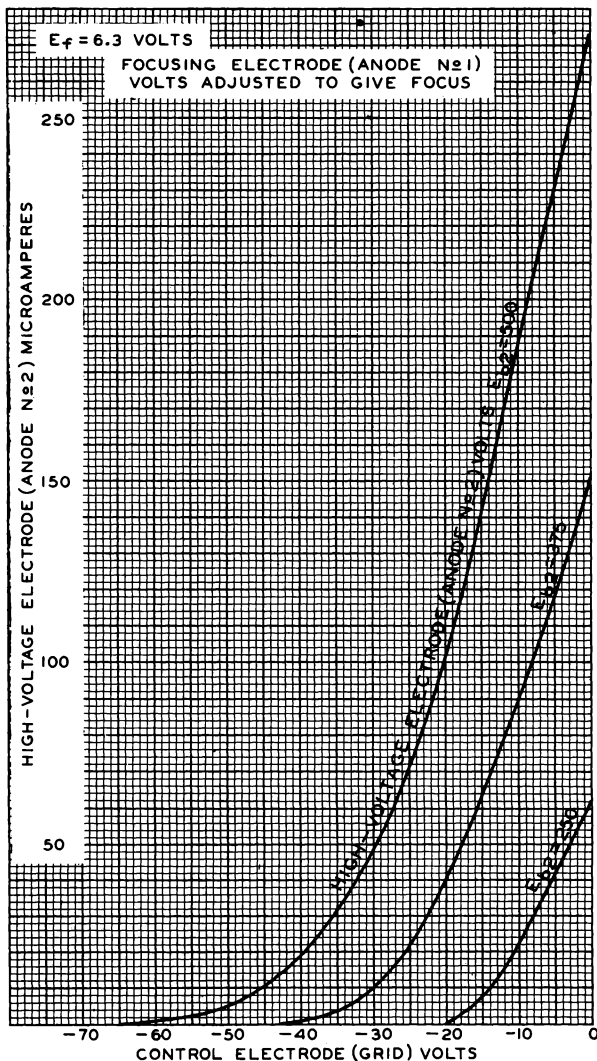


913



913

AVERAGE CHARACTERISTICS



OCT. 20, 1936

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-4680



914-A

914-A

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

General:

DATA

Heater, for Unipotential Cathode:

Voltage. 2.5 ac or dc volts

Current. 2.1 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes. . . 10.5 μf DJ₁ to DJ₂ 2.0 μf DJ₃ to DJ₄ 1.0 μf

Phosphor (For Curves, see front of this Section) No.1

Fluorescence Green

Persistence. Medium

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Overall Length 20-1/16" $\pm$ 3/8"Greatest Diameter of Bulb. 9-1/4" $\pm$ 1/8"

Minimum Useful Screen Diameter 8-1/4"

Mounting Position. Any

Caps:

Anode No.2 Medium

Deflecting Electrodes (Four) Small

Base Long Medium-Shell Small 6-Pin

BOTTOM VIEW

Pin 1 - Heater

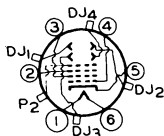
Pin 2 - Anode No.1

Pin 3 - Grid No.2

Pin 4 - Grid No.1

Pin 5 - Cathode

Pin 6 - Heater

Single Medium Cap-
Anode No.2Cap } { Deflecting
over } { Electrode
Pin 2 } { DJ₁Cap } { Deflecting
over } { ElectrodePin 5 } { DJ₂Cap } { Deflecting
over } { ElectrodePins } { DJ₃1 & 6 } { Deflecting
Cap } { ElectrodePins } { DJ₄

3 & 4 } { }

DJ₁ and DJ₂ are nearer the screenDJ₃ and DJ₄ are nearer the base

With DJ₁ positive with respect to DJ₂ the spot is deflected toward pin 2. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pins 1 and 6.

The angle between the trace produced by DJ₁ and DJ₂ and its intersection with the plane through the tube axis and pin 2 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° $\pm$ 6°.

Maximum Ratings, Design-Center Values:

ANODE-NO.2 VOLTAGE° 7000 max. volts

ANODE-NO.1 VOLTAGE. 1900 max. volts

° The product of anode-No.2 voltage and average anode-No.2 current should never exceed 6 watts.

914-A



914-A

OSCILLOGRAPH TUBE

GRID No.2 VOLTAGE.	300 max.	volts
→ GRID No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2		
AND ANY DEFLECTING ELECTRODE	3000 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode. .	125 max.	volts
Heater positive with respect to cathode. .	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between 1500 and 7000 volts*

Anode-No.1 Voltage. . .	15% to 26% of E_{b2}		volts
Grid-No.2 Voltage . . .	250		volts
Max. Grid-No.1 Voltage			
for Visual Cutoff.	30% of E_{b2}		volts
Max. Anode-No.1			
Current Range.	-15 to + 10		μ amp
Deflection Factors:			
DJ ₁ to DJ ₂	38 to 54	v dc/in./kv of E_{b2}	
DJ ₃ to DJ ₄	30 to 44	v dc/in./kv of E_{b2}	

Examples of Use of Design Ranges:

For Anode-No.2 Volt. of	1500	2500	5000	7000	volts
Anode-No.1 Voltage. .	225-390	375-650	750-1300	1050-1800	volts
Grid-No.2 Voltage . .	250	250	250	250	volts
Max. Grid-No.1 Volt.					
for Visual Cutoff	-75	-75	-75	-75	volts
Deflection Factors:					
DJ ₁ to DJ ₂	57-81	93-135	190-270	266-378	v dc/in
DJ ₃ to DJ ₄	45-66	75-110	150-220	210-308	v dc/in

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode		
Circuit [□]	5 max.	megohms

Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance incircuit between indicated electrode and the output

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.

□ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

→ Indicates a change.



914-A

914-A

OSCILLOGRAPH TUBE

capacitor should be as follows:

Grid-No.1-Circuit Resistance.	150 min.	ohms
Grid-No.2-Circuit Resistance.	330 min.	ohms
Anode-No.1-Circuit Resistance.	2000 min.	ohms
Anode-No.2-Circuit Resistance.	8200 min.	ohms

The resistors should be capable of withstanding the applied voltages.

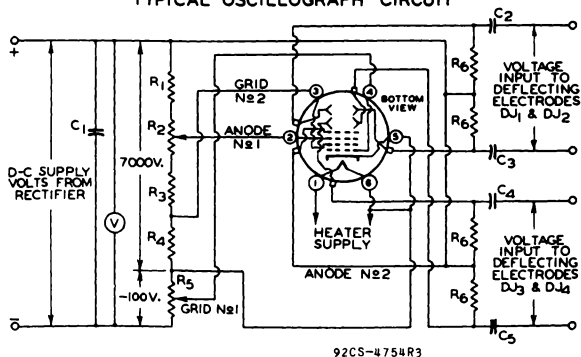
914-A



914-A

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-4754R3

C₁ = FILTER CAPACITOR 0.5 to 2.0 μ fC₂, C₃, C₄, C₅ = SEE NOTER₁ + R₂ + R₃ + R₄ + R₅ = BLEEDER POTENTIOMETERR₁ = 2.5 MEGOHMSR₂ = 0.5 MEGOHMR₃ = 0.375 MEGOHMR₄ = 0.125 MEGOHMR₅ = 0.050 MEGOHMR₆ = SEE □ ON

V = BACK OF DATA 1

V = VOLTMETER

NOTE: When the cathode or the negative end of the cathode-ray high-voltage supply is grounded, blocking capacitors C₂, C₃, C₄, and C₅ should have a high voltage rating. When anode No. 2 is grounded, C₂, C₃, C₄, and C₅ may be low-voltage capacitors.

For dc amplifier service, the deflecting electrodes should be coupled direct to the output of the amplifier by omitting the blocking capacitors. In addition, it will usually be preferable to remove the associated deflecting-electrode resistor in order to minimize the loading effect of the resistor on the dc amplifier. With the resistor removed, it is essential, in order to minimize spot defocusing, that anode No. 2 be returned to some point in the dc amplifier circuit such that the potential difference between anode No. 2 and the average voltage across the deflecting electrodes will be as low as possible.

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

MAY 1, 1950

TUBE DEPARTMENT

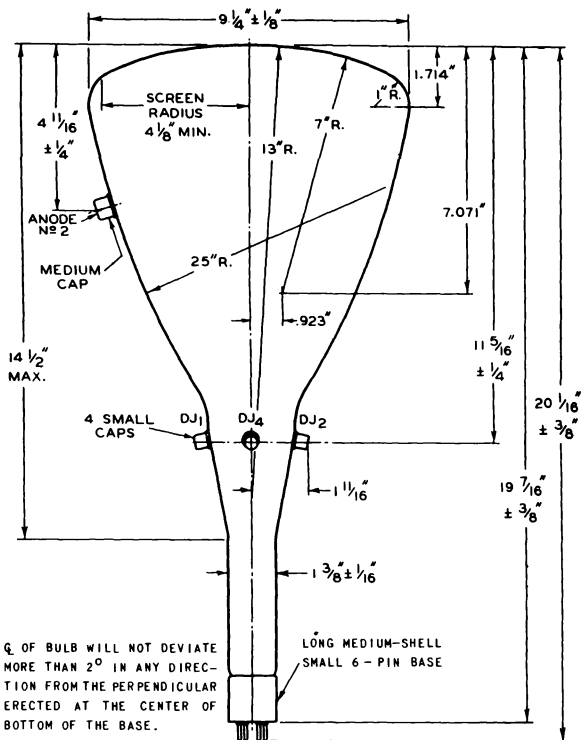
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-4754R3

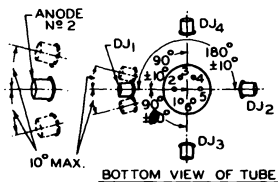


914-A OSCILLOGRAPH TUBE

914-A



Q OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.



BOTTOM VIEW OF TUBE

92CM-47 18R3

MAY 1, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

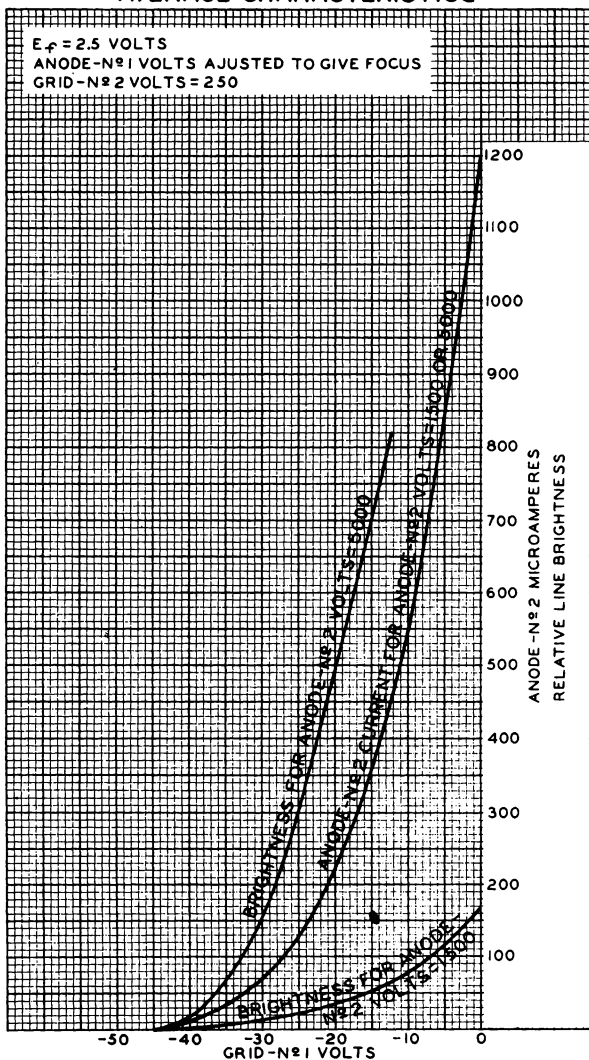
CE-4718R3

914-A



914-A

AVERAGE CHARACTERISTICS



JULY 19, 1946

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6785RI



1848

1848 ICONOSCOPE

For use in portable television cameras

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.6	amp.
Deflection		Magnetic
Type of Pickup		Direct
Direct Interelectrode Capacitance:		
Signal Plate to Collector & Anode No.2		
(with external shielding)	10 approx.	μpf
Control Grid to All Other Electrodes	12 max.	μpf
Dimensions	See Outline Drawing	
Caps (two)		Small Metal
Base	Dwarf Metal Shell Octal 8-Pin	

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

High-Voltage Electrode (Anode No.2)		
& Collector Voltage	1200 max.	volts
Accelerating Electrode (Grid No.2) Voltage	1200 max.	volts
Focusing Electrode (Anode No.1) Voltage	400 max.	volts
Control Electrode (Grid No.1) Voltage	Never Positive	
Grid No.1 Volt. for Current Cut-Off	-50 approx.	volts
Anode No.2 & Collector Current *	0.5 max.	μamp.
Ambient Temperature	40 max.	°C
Typical Operation:		
Heater Voltage °	6.3	volts
Anode No.2 & Collector Voltage	1000	volts
Grid No.2 Voltage	1000	volts
Anode No.1 Voltage •	300 approx.	volts
Grid No.1 Voltage ▲ #	-40 approx.	volts
Anode No.2 & Collector Current *	0.1 approx.	μamp.

- Design maximum for 117-volt line.
 - ° When this current is measured, the mosaic should not be illuminated.
 - The cathode should be connected to one side or, preferably, to the mid-tap of the heater winding.
 - ▲ Should be adjusted and set at largest negative value which will provide sufficient video output.
 - * Maximum d-c resistance in the grid circuit should not exceed 1 megohm.
 - Should be adjusted and set at value giving best focus.
- NOTE: Signal plate-to-collector impedance is a function of bias light, image brilliance, and beam current, and is in the order of a few megohms for normal operation. Normal beam current is in the order of 0.25 micro-ampere.

The signal-plate resistive load should be approximately one-tenth of the signal plate-to-collector impedance if constant signal output without phase shift is required in all frequencies of the picture signal.

A practical design value of signal-plate load impedance is in the order of 0.1 to 0.5 megohm. With low values of load resistance, gain and signal output-to-noise ratio are low. With high values, gain and signal output-to-noise ratio are increased. In either case, the low video frequencies are over-emphasized and must be equalized by a video stage having low low-frequency gain.

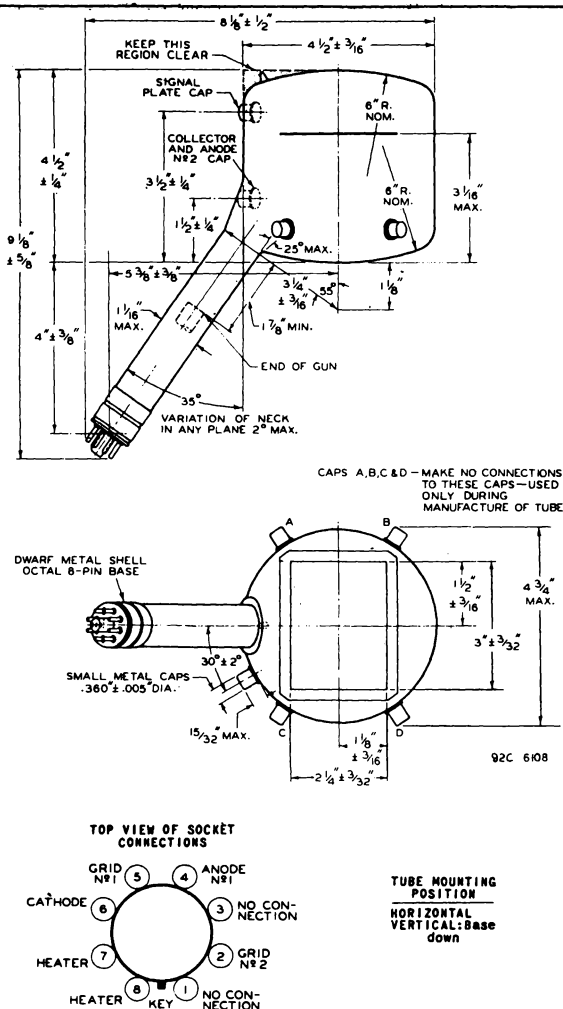
Signal output current varies with beam current, illumination level, and bias lighting, but is in the order of 0.15 microampere peak to peak. Good operation can be obtained with a highlight illumination level on the mosaic in the order of 7 foot-candles.

The spectral sensitivity of the 1848 is adjusted for outdoor pickup. The d-c resistance in the signal-plate circuit should be limited to one megohm.



1848

ICONOSCOPE



April 15, 1940

92C-6108

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.



1850-A

1850-A

ICONOSCOPE

FOR PICKUP FROM MOTION-PICTURE FILM OR SLIDES

DATA

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes 6.5 μf Signal Electrode to Grid No.4⁰ 10 μf

Mosaic, Photosensitive:

Response See Curve

Useful Size of Rectangular Image

(4 x 3 Aspect Ratio) 5.75" max. diagonal ←

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 55° ←

Max. Width of Mounted Tube 8-1/8"

Height of Mounted Tube $10\text{--}3/16" \pm 3/4"$ Depth of Mounted Tube $12\text{--}13/16" \pm 3/4"$

Mounting Position Mosaic in vertical plane

Minimum Deflecting-Coil Inside Diameter 1-1/2" ←

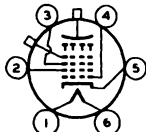
Maximum Deflecting-Coil Length 2-1/4" ←

Caps (Two) Medium (JETEC No.C1-5)

Base Long Medium-Shell Small 6-Pin

BOTTOM VIEW

Pin 1 - Heater
 Pin 2 - Grid No.2
 Pin 3 - Grid No.3
 Pin 4 - Grid No.1
 Pin 5 - Cathode
 Pin 6 - Heater

DIRECTION OF LIGHT
IS NORMAL TO MOSAIC

Caps { See Outline
 Drawing
 S_J - Signal
 Electrode
 G₄ - Grid No.4
 (Collector)

Maximum Ratings, Absolute Values:

AVERAGE MOSAIC ILLUMINATION* 50 max. ft-c ←

OPERATING TEMPERATURE OF BULB

AT LARGE END OF TUBE 40 max. °C ←

SIGNAL-ELECTRODE VOLTAGE 1200 max. volts

GRID-No.4 (COLLECTOR) VOLTAGE 1200 max. volts

GRID-No.3 VOLTAGE 450 max. volts

GRID-No.2 VOLTAGE 1200 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode 125 max. volts

Heater positive with respect to cathode 10 max. volts

GRID-No.4 CURRENT 0.5 max. μamp ⁰ With external shield.

* Averaged over any interval of 1 sec. max.

← Indicates a change.

MAY 1, 1951

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1850-A



1850-A ICONOSCOPE

Typical Operation and Characteristics:

Signal-Electrode Voltage	1000	volts
Grid-No.4 Voltage	1000	volts
Grid-No.3 Voltage (Beam Focus)— 24% to 36% of Grid-No.4 Voltage.	240 to 360	volts
Grid-No.2 Voltage	1000	volts
→ Max. Grid-No.1 Voltage for Pattern Cutoff— 7% of Grid-No.4 Voltage	-70	volts
→ Grid-No.4 Current (With no illumination on mosaic)*.	0.1 to 0.2	μamp
External Load Resistance	0.1	megohm
→ Illumination on Mosaic:		
Steady Highlight Value for Slides.	4 to 6	ft-c
Average Pulsed Highlight Value for Motion-Picture Film.	10 to 20	ft-c
→ Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.).	100	
→ Minimum Peak-to-Peak Blanking Voltage.	20	volts
→ Deflecting-Coil Current (Approx.):**		
Horizontal (Peak to peak).	600	ma
Vertical (Peak to peak).	140	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.0 max. megohm
--	-----------------

* Allowance should be made for leakage currents.

** For RCA Deflecting Yoke No. 201076.

→ indicates a change.

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

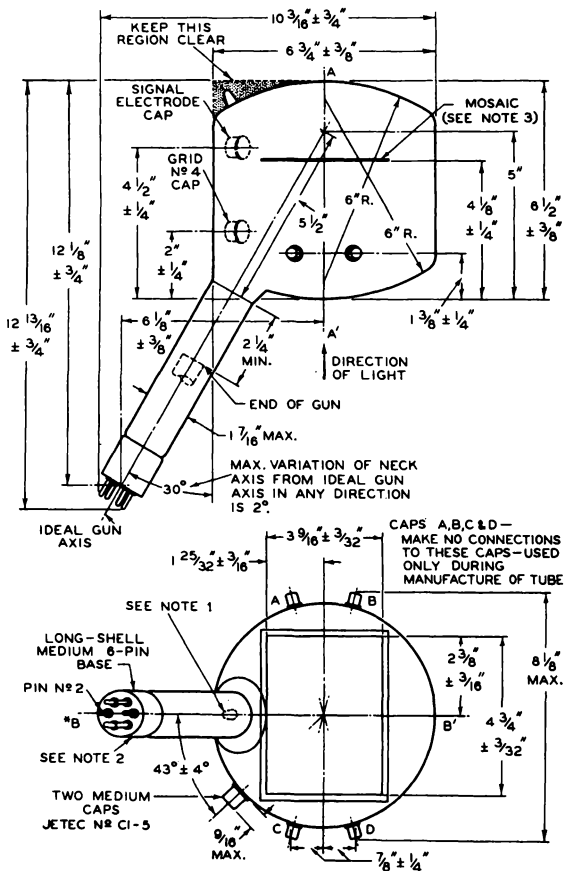
DATA



1850-A

ICONOSCOPE

1850-A



92CM-4891R3

* BB' IS THE PLANE THROUGH THE BULB AXIS AA' AND THE IDEAL GUN AXIS.

← Indicates a change.

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-4891R3A

1850-A



1850-A

ICONOSCOPE

NOTE 1: VARIATION OF TIP CENTER FROM PLANE BB' IS 1/2".

NOTE 2: MAXIMUM ROTATION OF LINE THROUGH PINS 2 AND 5 ABOUT IDEAL GUN AXIS IS $\pm 10^\circ$, MEASURED FROM PLANE BB'.

NOTE 3: DEVIATION OF PLANE OF MOSAIC FROM PLANE PERPENDICULAR TO THE BULB AXIS AA' IS 2.5° MAX. ROTATION OF MOSAIC ABOUT THE BULB AXIS AA' WITH RESPECT TO A LINE OF INTERSECTION FORMED BY MOSAIC PLANE AND PLANE BB' IS 2.5° MAX.

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-4891R3B

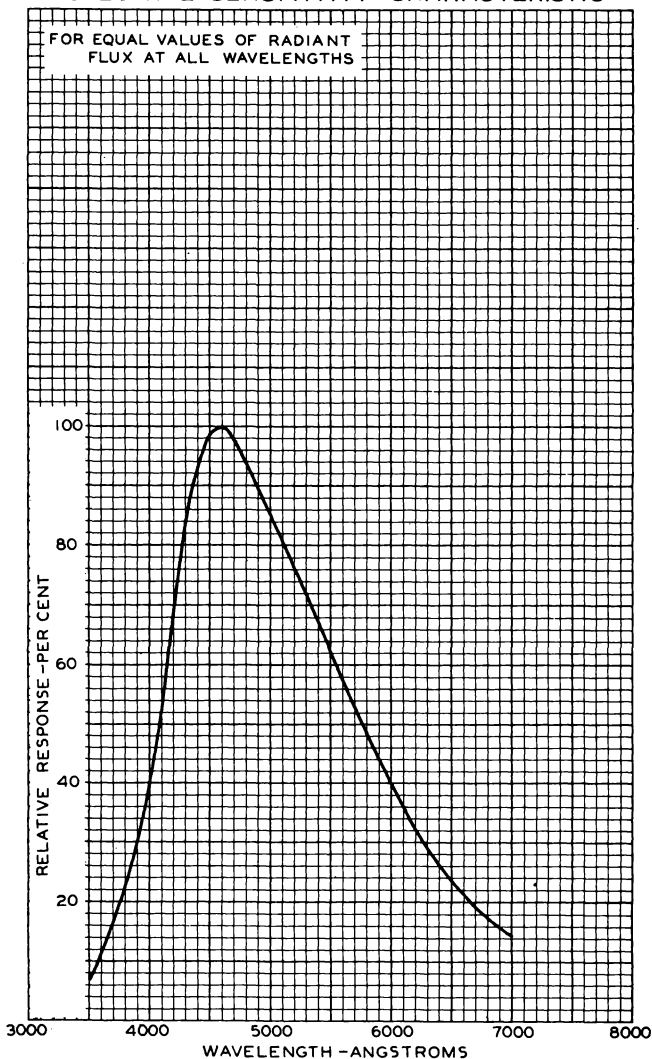


1850-A

1850-A

SPECTRAL SENSITIVITY CHARACTERISTIC

FOR EQUAL VALUES OF RADIANT
FLUX AT ALL WAVELENGTHS



JUNE 18, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

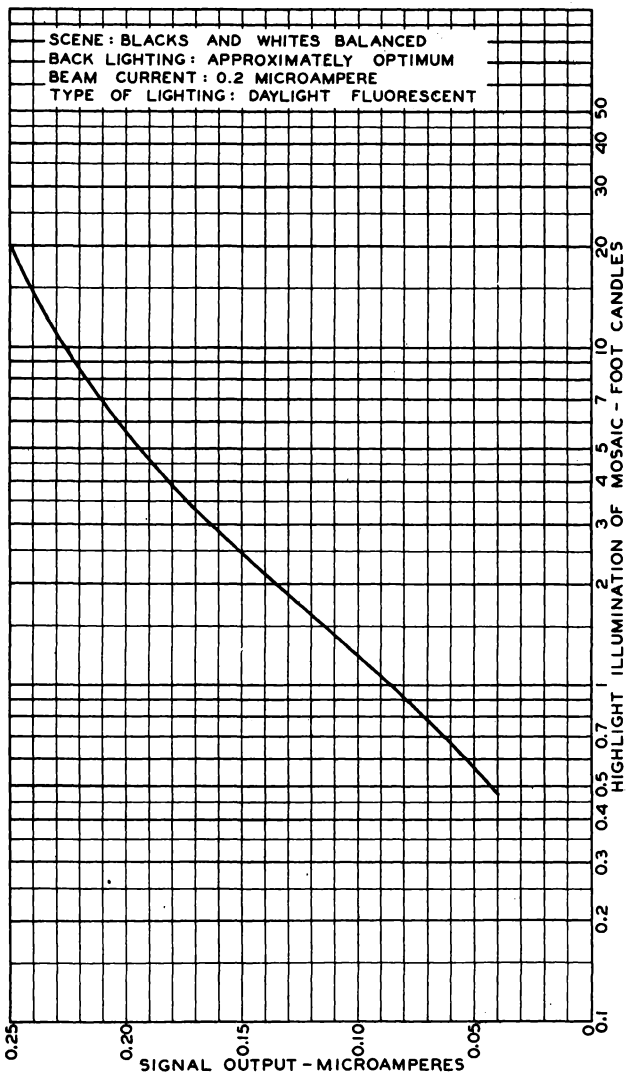
92CM-6404R1

1850-A



1850-A

TYPICAL SIGNAL-OUTPUT CHARACTERISTIC



JAN. 2, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-658IRI



5527

ICONOSCOPE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitances (Approx.):[▲]Grid No.1 to All Other Electrodes 7.5 μf Signal Electrode to All Other Electrodes
and External Shield 5 μf

Focusing Method Electrostatic

Deflection Method Electrostatic

Image Size (4 x 3 aspect ratio) 1.4" Diagonal

Overall Length 9" $\pm 1/4$ "Seated Length 8-1/4" $\pm 1/4$ "

Maximum Diameter 2-1/4"

Mounting Position Any

Cap Recessed Small Cavity

Base Medium-Shell Diheptal 12-Pin

Basing Designation for BOTTOM VIEW 14L

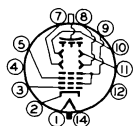
Pin 1 - Heater

Pin 2 - Cathode

Pin 3 - Grid No.1

Pin 4 - Internal
Connection -
Do Not Use

Pin 5 - Grid No.3

Pin 7 - Deflecting
Electrode
DJ3Pin 8 - Deflecting
Electrode
DJ4DIRECTION OF LIGHT:
INTO END OF BULBPin 9 - Anode No.2,
Grid No.4Pin 10 - Deflecting
Electrode
DJ2Pin 11 - Deflecting
Electrode
DJ1Pin 12 - Internal
Connection -
Do Not UsePin 14 - Heater
Cap - Signal
Electrode

Maximum Ratings, Design-Center Values:

SIGNAL-ELECTRODE VOLTAGE 900 max. volts

GRID-No.4 & GRID-No.2 VOLTAGE 900 max. volts

GRID-No.3 VOLTAGE 450 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 100 max. volts

Positive bias value 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect
to cathode 125 max. voltsHeater positive with respect
to cathode 10 max. volts

AMBIENT TEMPERATURE 40 max. °C

MOSAIC ILLUMINATION 50 max. foot-candles

[▲] With external shield.

APRIL 15, 1947

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5527



5527

ICONOSCOPE

Typical Operation:

Signal-Electrode Voltage	800		volts
Grid-No.4 & Grid-No.2 Voltage . . .	800		volts
Grid-No.3 Voltage for Focus . . .	125 to 250		volts
Grid-No.1 Voltage	Adjust for best picture		
Max. Grid-No.1 Voltage for Picture Cutoff	-75		volts
Max. Deflecting Voltages (Peak-to-Peak)*:			
DJ ₁ & DJ ₂ (Vertical)	120		volts
DJ ₃ & DJ ₄ (Horizontal)	100		volts
Min. Peak-to-Peak Blanking Voltage	30		volts
Signal-Output Current (Approx.) . .	0.025		μamp
Output Resistor (Approx.)	1.0		megohm

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . .	1.0 max.		megohm
Resistance in any Deflecting- Electrode Circuit [□]	5.0 max.		megohms

* To scan picture of 1.4" diagonal (4 x 3 aspect ratio).

□ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

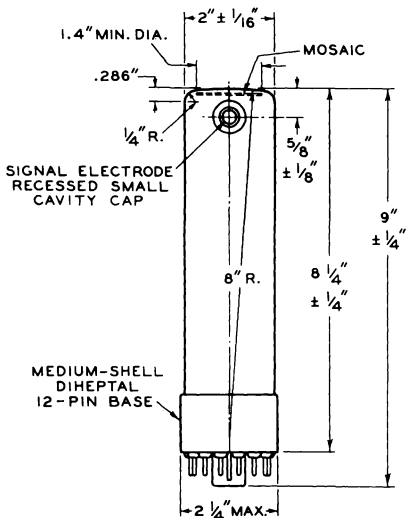
The SPECTRAL SENSITIVITY CHARACTERISTIC curve
for the 5527 is the same as that shown
for Type 1850-A.



5527

ICONOSCOPE

5527



CL OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

THE PLANE THROUGH THE TUBE AXIS AND BASE-PLUG KEY MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND SIGNAL ELECTRODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 20° . SIGNAL ELECTRODE TERMINAL IS ON SAME SIDE AS BASE-PLUG KEY.

DJ1 AND DJ2 ARE NEARER THE MOSAIC; DJ3 AND DJ4 ARE NEARER THE BASE. WITH DJ1 POSITIVE WITH RESPECT TO DJ2, THE SPOT IS DEFLECTED TOWARD PIN 5. WITH DJ3 POSITIVE WITH RESPECT TO DJ4, THE SPOT IS DEFLECTED TOWARD PINS 1 AND 2. WITH DJ1 AND DJ2 USED FOR VERTICAL DEFLECTION, THE VERTICAL AXIS OF THE SCANNED AREA OF THE MOSAIC IS PARALLEL TO VERTICAL PLANE THROUGH PINS 5 AND 12 WITHIN $\pm 15^{\circ}$. THE ANGLE BETWEEN THE SCANNING DIRECTION PRODUCED BY DJ3 AND DJ4 AND THE SCANNING DIRECTION PRODUCED BY DJ1 AND DJ2 IS $90^{\circ} \pm 3^{\circ}$.

92CS-6803



5655

IMAGE ORTHICON

MAGNETIC FOCUS—MAGNETIC DEFLECTION

5655

DATA**General:**

Heater, for Unipotential Cathode:

Voltage. $6.3 \pm 10\%$ ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitance:

Anode to All Other Electrodes 20 μmf

Photocathode Spectral Response See Curve

Image Size (4 x 3 aspect ratio). 1/6" Diagonal

Focusing Method. Magnetic

Deflection Method Magnetic

Overall Length $15\text{--}1\frac{1}{4}" \pm \frac{1}{4}"$ Greatest Diameter of Bulb. $3" \pm \frac{1}{16}"$ Minimum Deflecting-Coil Inside Diameter. $2\text{--}\frac{1}{8}"$

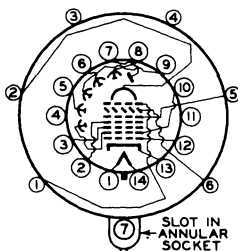
Deflecting-Coil Length 5"

Focusing-Coil Length 10"

Alignment-Coil Length. $15\frac{1}{16}"$ Photocathode Distance Inside End of Focusing Coil. $\frac{1}{2}"$ Operating Position Any except with diheptal base
up and tube axis at angle of
less than 20° from the vertical

End Base Small-Shell Diheptal 14-Pin

BOTTOM VIEW

DIRECTION OF LIGHT:
PERPENDICULAR TO
LARGE END OF TUBEWHITE INDEX LINE
ON FACE

- Pin 1—Heater
- Pin 2—Grid No.4
- Pin 3—Grid No.3
- Pin 4—Internal Connection—Do Not Use
- Pin 5—Dynode No.2
- Pin 6—Dynode No.4
- Pin 7—Anode
- Pin 8—Dynode No.5
- Pin 9—Dynode No.3
- Pin 10—Dynode No.1,
Grid No.2
- Pin 11—Internal Connection—Do Not Use
- Pin 12—Grid No.1
- Pin 13—Cathode
- Pin 14—Heater

Shoulder Base. Keyed Jumbo Annular 7-Pin

- | | |
|--------------------------------------|--------------------------------------|
| Pin 1—Grid No.6 | Pin 5—Grid No.5 |
| Pin 2—Photocathode | Pin 6—Target |
| Pin 3—Internal Connection—Do Not Use | Pin 7—Internal Connection—Do Not Use |
| Pin 4—Internal Connection—Do Not Use | |

5655



5655

IMAGE ORTHICON

Maximum Ratings, Absolute Values:

PHOTOCATHODE VOLTAGE	-550 max.	volts
PHOTOCATHODE ILLUMINATION	50 max.	ft-c
OPERATING TEMPERATURE OF ANY PART OF BULB	65 max.	°C
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE (Target Section) . . .	45 min.	°C
TEMPERATURE DIFFERENCE BETWEEN TARGET SECTION AND ANY PART OF BULB HOTTER THAN TARGET SECTION.	5 max.	°C
GRID-No.6 VOLTAGE.	-550 max.	volts
TARGET VOLTAGE:		
Positive value	50 max.	volts
Negative value	50 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE.	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	125 max.	volts
Positive bias value.	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts
ANODE-SUPPLY VOLTAGE*	1500 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation:

Photocathode Voltage (Image Focus) . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 80% of photocathode voltage.	-240 to -400	volts
Target Voltage*	0	volts
Grid-No.5 Voltage (Decelerator)** . .	0 to 100	volts
Grid-No.4 Voltage (Beam Focus)	160 to 240	volts
Grid-No.3 Voltage***	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage. . . .	300	volts
Grid-No.1 Voltage (For Picture Cutoff)	-35 to -100	volts
Dynode-No.2 Voltage.	600	volts
Dynode-No.3 Voltage.	800	volts
Dynode-No.4 Voltage.	1000	volts
Dynode-No.5 Voltage.	1200	volts
Anode Voltage.	1250	volts
Anode Current.	100	μa
Target Temperature Range	45 to 60	°C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.).	70	
Minimum Peak-to-Peak Blanking Voltage	10	volts
Field Strength at Center of Focusing Coil	75	gausses

•, •, •, •, •: See next page.



5655

IMAGE ORTHICON

5655

Focusing-Coil Current (Approx. for coil listed below)	75	ma
Deflecting-Coil Current (Approx. for assembly listed below):		
Horizontal (Peak to Peak)	625	ma
Vertical (Peak to Peak)	290	ma
Alignment-Coil Current (Approx. for coil listed below)	0 to 30	ma

Components:

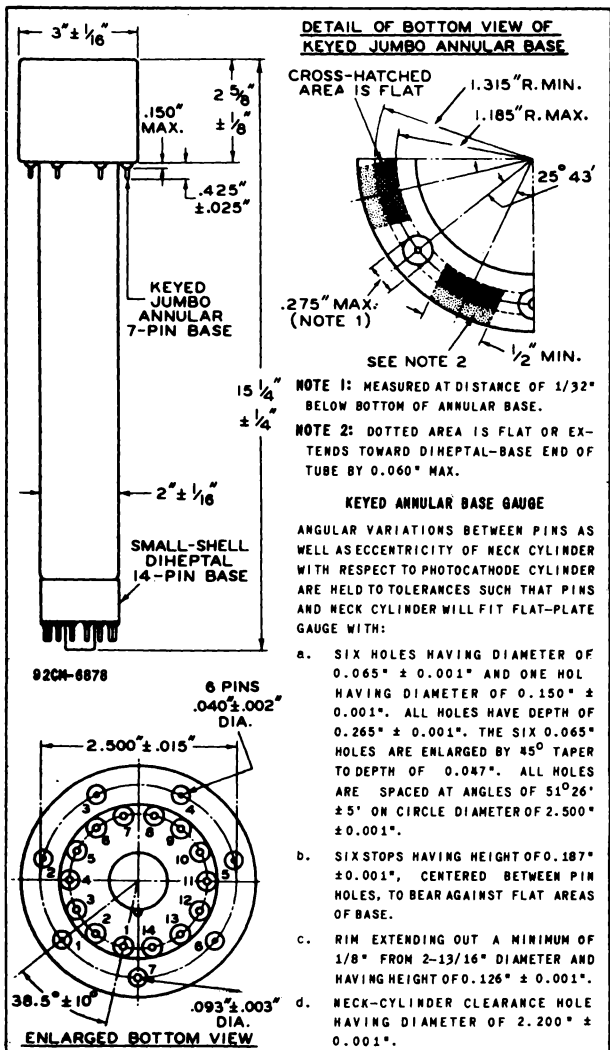
Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket) . .	RCA Type No. 201D75
Focusing-Coil Assembly	RCA Type No. 202D75
Alignment-Coil Assembly	RCA Type No. 204D75
Hor. Deflection Output Transformer . .	RCA Type No. 204T1
Ver. Deflection Output Transformer . .	RCA Type No. 204T2

- ⊕ Ratio of dynode voltages is shown under Typical Operation.
- Adjustable within ± 3 volts of indicated value, with blanking voltage off.
- Taps at 0, 30, 60, and 90 volts are recommended. Set at voltage giving most uniform resolution and most uniform background shading over entire picture area.
- ## Adjust to give the most uniformly shaded picture near maximum signal.

5655



5655 IMAGE ORTHICON



OCTOBER 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6878

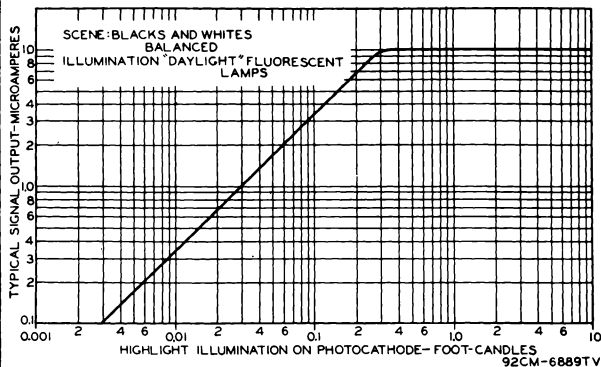
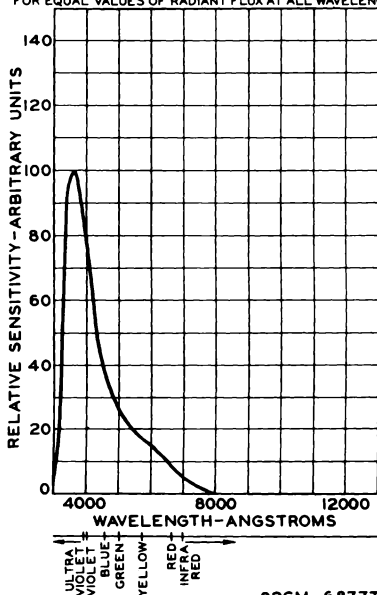


5655

5655

CHARACTERISTIC CURVES

TYPICAL SIGNAL OUTPUT

SPECTRAL SENSITIVITY CHARACTERISTIC
FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS

OCTOBER 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6889TV-6877T



5769

5769

IMAGE ORTHICON

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA**General:**

Heater, for Unipotential Cathode:

Voltage. 6.3 $\pm$ 10% ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitance:

Anode to All Other Electrodes 20 μ f

Photocathode Spectral Response See Curve

Image Size (3 x 4 aspect ratio). 1.6" Diagonal

Focusing Method. Magnetic

Deflection Method. Magnetic

Overall Length 15-1/4" $\pm$ 1/4"Greatest Diameter of Bulb. 3" $\pm$ 1/16"

Minimum Deflecting-Coil Inside Diameter. 2-1/8"

Deflecting-Coil Length 5"

Focusing-Coil Length 10"

Alignment-Coil Length. 15/16"

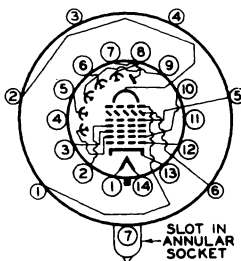
Photocathode Distance Inside End of Focusing Coil. . . . 1/2"

Operating Position Any except with diheptal base
up and tube axis at angle of
less than 20° from the vertical

End Base Small-Shell Diheptal 14-Pin

- Pin 1-Heater
 Pin 2-Grid No.4
 Pin 3-Grid No.3
 Pin 4-Internal Con-
 nection-Do Not Use
 Pin 5-Dynode No.2
 Pin 6-Dynode No.4
 Pin 7-Anode
 Pin 8-Dynode No.5
 Pin 9-Dynode No.3
 Pin 10-Dynode No.1,
 Grid No.2
 Pin 11-Internal Con-
 nection-Do Not Use
 Pin 12-Grid No.1
 Pin 13-Cathode
 Pin 14-Heater

BOTTOM VIEW
 DIRECTION OF LIGHT:
 PERPENDICULAR TO
 LARGE END OF TUBE



WHITE INDEX LINE
 ON FACE

Shoulder Base. Keyed Jumbo Annular 7-Pin

- Pin 1-Grid No.6
 Pin 2-Photocathode
 Pin 3-Internal Con-
 nection-Do Not Use
 Pin 4-Internal Con-
 nection-Do Not Use

- Pin 5-Grid No.5
 Pin 6-Target
 Pin 7-Internal Con-
 nection-Do Not Use



IMAGE ORTHICON

Maximum Ratings, Absolute Values:

PHOTOCATHODE VOLTAGE	-550 max.	volts
PHOTOCATHODE ILLUMINATION	50 max.	ft-c
OPERATING TEMPERATURE OF ANY PART OF BULB	65 max.	°C
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE (Target Section)	35 min.	°C
TEMPERATURE DIFFERENCE BETWEEN TARGET SECTION AND ANY PART OF BULB HOTTER THAN TARGET SECTION	5 max.	°C
GRID-No.6 VOLTAGE	-550 max.	volts
TARGET VOLTAGE:		
Positive value	50 max.	volts
Negative value	50 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts
ANODE-SUPPLY VOLTAGE*	1650 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation:

Photocathode Voltage (Image Focus)	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 80% of photocathode voltage	-240 to -400	volts
Target Voltage*	0	volts
Grid-No.5 Voltage (Decelerator)**	0 to 100	volts
Grid-No.4 Voltage (Beam Focus)	160 to 240	volts
Grid-No.3 Voltage##	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage (For Picture Cutoff)	-45 to -115	volts
Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	880	volts
Dynode-No.4 Voltage	1160	volts
Dynode-No.5 Voltage	1450	volts
Anode Voltage	1500	volts
Anode Current	50	μa
Target Temperature Range	35 to 60	°C
Highlight Illumination on Photocathode for Maximum Signal Output:		
With 2870°K Tungsten Illumination	0.15	ft-c
With White Fluorescent Illumination or Daylight	0.07	ft-c
Ratio of Peak-to-Peak Highlight Video- Signal Cur. to RMS Noise Current (Approx.)	35	

*, **, ##: See next page.



5769

5769

IMAGE ORTHICON

Minimum Peak-to-Peak Blanking Voltage. . . .	10	volts
Field Strength at Center of Focusing Coil. .	75	gausses
Focusing-Coil Current (Approx. for coil coil listed below).	75	ma
Deflecting-Coil Current (Approx. for assembly listed below):		
Horizontal (Peak to Peak).	625	ma
Vertical (Peak to Peak).	290	ma
Alignment-Coil Current (Approx. for coil listed below).	0 to 30	ma

Components:

Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket). . .	RCA Type No. 201D75
Focusing-Coil Assembly	RCA Type No. 202D75
Alignment-Coil Assembly.	RCA Type No. 204D75
Hor. Deflection Output Transformer . . .	RCA Type No. 204T1
Ver. Deflection Output Transformer . . .	RCA Type No. 204T2

• Ratio of dynode voltages is shown under Typical Operation.

• Adjustable from -3 to +5 volts with blanking voltage off.

•• Taps at 0, 30, 60, and 90 volts are recommended. Set at voltage giving most uniform resolution and signal output over entire picture area.

••• Adjust to give the most uniformly shaded picture near maximum signal.

OPERATING NOTES

After the 5769 has been inserted in its sockets and the voltages applied, allow it to warm up for 1/2 to 1 hour with the camera lens iris closed. Then, proceed with normal operating adjustments.

When the equipment design or operating conditions are such that the maximum temperature rating or maximum temperature difference will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting coil and its extension. For this purpose, a small blower is satisfactory, but it should run at low speed to prevent vibration of the 5769 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur. To keep the operating temperature of the large end of the tube from falling below 35°C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface.

Resolution of better than 400 lines at the center of the picture can be produced by the 5769 when the highlight illumination is above the knee of the typical signal-output curve for this type. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 625 lines, it is necessary to use a video amplifier having a bandwidth of at least 5.5 megacycles. The maximum resolution obtainable is limited by the mesh-screen portion of the target.

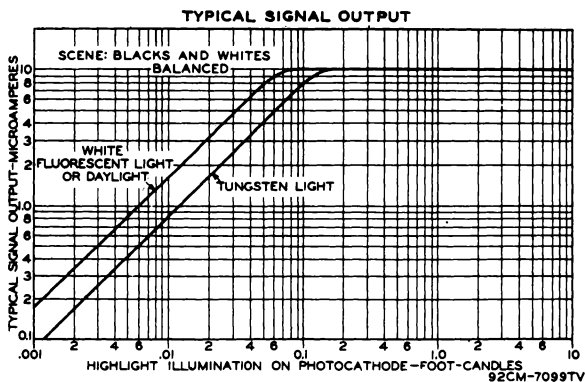
OUTLINE DIMENSIONS for the 5769 are the same
as those shown for Type 5655

5769

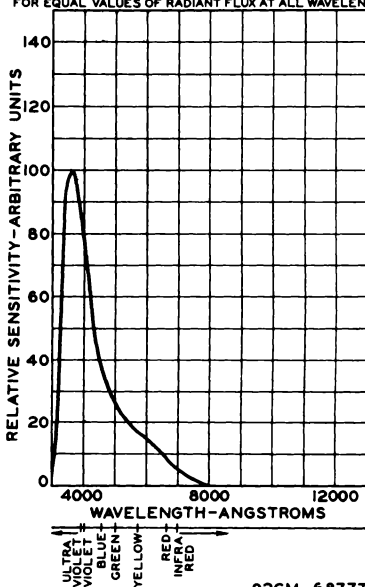


5769

CHARACTERISTICS CURVES



SPECTRAL SENSITIVITY CHARACTERISTIC
FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



92CM-6877T

FEB. 1, 1949

TUBE DEPARTMENT

CE-7099TV - 6877T

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5820

IMAGE ORTHICON

FOR OUTDOOR AND STUDIO PICKUP

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitance (Approx.):

Anode to all other electrodes 12 μf ←

Photocathode, Semitransparent:

Response . . . See accompanying Spectral Sensitivity curve

Rectangular image (4x3 aspect ratio):

Useful size of 1.6" max. Diagonal

Orientation of . . . Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through the center of faceplate and pin No.7 of the shoulder base.

Focusing Method Magnetic

Deflection Method Magnetic

Overall Length $15\text{--}3/16" \pm 1/4"$ Greatest Diameter of Bulb $3" \pm 1/16"$ ←Minimum Deflecting-Coil Inside Diameter $2\text{--}3/8"$ ←

Deflecting-Coil Length 5"

Focusing-Coil Length 10"

Alignment-Coil Length $15/16"$ Photocathode Distance Inside End of Focusing Coil . . . $1/2"$ Operating Position: Any except with diheptal base up and tube axis at angle of less than 20° from vertical

Weight (Approx.) 1.4 lbs ←

End Base . . . Small-Shell Diheptal 14-Pin (JETEC No. B14-45)

BOTTOM VIEW

Pin 1-Heater

Pin 2-Grid No.4

Pin 3-Grid No.3

Pin 4-Internal Connection-Do Not Use

Pin 5-Dynode No.2

Pin 6-Dynode No.4

Pin 7-Anode

Pin 8-Dynode No.5

Pin 9-Dynode No.3

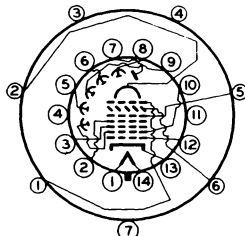
Pin 10-Dynode No.1,
Grid No.2

Pin 11-Internal Connection-Do Not Use

Pin 12-Grid No.1

Pin 13-Cathode

Pin 14-Heater

DIRECTION OF LIGHT:
PERPENDICULAR TO
LARGE END OF TUBEWHITE INDEX LINE
ON FACE

(Continued on next page)

←Indicates a change.

JAN. 3, 1955

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5820



5820

IMAGE ORTHICON

Shoulder Base	Keyed Jumbo Annular 7-Pin
Pin 1—Grid No.6	Pin 5—Grid No.5
Pin 2—Photocathode	
Pin 3—Internal Connec- tion—Do Not Use	Pin 6—Target
Pin 4—Internal Connec- tion—Do Not Use	Pin 7—Internal Connec- tion—Do Not Use

Maximum Ratings, Absolute Values:**PHOTOCATHODE:**

Voltage	-550 max.	volts
Illumination	50 max.	ft-c

OPERATING TEMPERATURE:

Of any part of bulb	50 max.	°C
Of bulb at large end of tube (target section)	35 min.	°C

TEMPERATURE DIFFERENCE:

Between target section and any part of bulb hotter than target section . .	5 max.	°C
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GRID-No.6 VOLTAGE	-550 max.	volts
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TARGET VOLTAGE:

Positive value	10 max.	volts
Negative value	10 max.	volts

GRID-No.5 VOLTAGE	150 max.	volts
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GRID-No.4 VOLTAGE	300 max.	volts
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GRID-No.3 VOLTAGE	400 max.	volts
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GRID-No.2 & DYNODE-No.1 VOLTAGE	350 max.	volts
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GRID-No.1 VOLTAGE:

Negative bias value	125 max.	volts
Positive bias value	0 max.	volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode .	125 max.	volts
Heater positive with respect to cathode .	10 max.	volts

ANODE-SUPPLY VOLTAGE*	1350 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation and Characteristics:

Photocathode Voltage (Image Focus) . . .	-300 to -500	volts
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Grid-No.6 Voltage (Accelerator)—

75% of photocathode voltage	-225 to -375	volts
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Target Voltage ^o	0 to 3	volts
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Grid-No.5 Voltage (Decelerator)	0 to 125	volts
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Grid-No.4 Voltage (Beam Focus)	160 to 220	volts
--	------------	-------

Grid-No.3 Voltage*.	225 to 330	volts
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Grid-No.2 & Dynode-No.1 Voltage	300	volts
---	-----	-------

Grid-No.1 Voltage for Picture Cutoff .	-45 to -115	volts
--	-------------	-------

* Ratio of dynode voltages is shown under *Typical Operation*.^o Adjustable from -3 to +5 volts with blanking voltage off.

* Adjust to give the most uniformly shaded picture near maximum signal.

→ Indicates a change.



5820

5820

IMAGE ORTHICON

Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Anode Current (DC)	30	μ amp
Signal-Output Current (Peak to peak) . .	2 to 15	μ amp
Target Temperature Range	35 to 45	$^{\circ}$ C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.)	35	
Minimum Peak-to-Peak Blanking Voltage . .	5	volts
Field Strength at Center of Focusing Coil [▲]	75	gausses
Field Strength of Alignment Coil (Approx.)	0 to 3	gausses

[▲] Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.

OPERATING CONSIDERATIONS

When the equipment design or operating conditions are such that the *maximum temperature rating* or *maximum temperature difference* as given under *Maximum Ratings* will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting-coil assembly and its extension. Any attempt to effect cooling of the tube by circulating even a large amount of air around the focusing coil will do little good, but a small amount of air directly in contact with the bulb surface will effectively drop the bulb temperature. For this purpose, a small blower is satisfactory, but it should be run at low speed to prevent vibration of the 5820 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur.

To keep the operating temperature of the large end of the tube from falling below 35°C , some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface. If, in special cases, a target heater is required, it should fit between the focusing coil and the bulb near the shoulder of the tube, and be non-inductively wound.

Resolution in excess of 500 lines at the center of the picture can be produced by the 5820. The Amplitude Response Characteristic shows the relative center amplitude response versus television line number for the 5820 when it is operated with the highlights at the knee of the light

5820



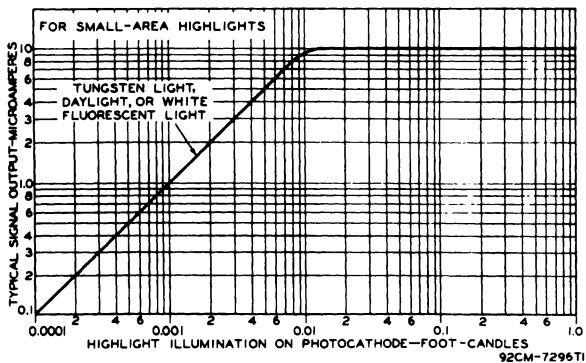
5820

IMAGE ORTHICON

transfer characteristic and at one lens stop above the knee and at a temperature of 35°C . To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 6 megacycles. The maximum resolution obtainable is limited by the mesh-screen portion of the target.

For very high illumination or for individual tubes with exceptionally high photocathode sensitivity, it may not be possible to stop the lens down far enough to reduce the highlight illumination on the photocathode to a value near the knee of the transfer characteristic. When such a condition is encountered, the use of a Wratten neutral filter selected to give the required reduction in illumination is recommended. Ordinarily, two filters—one having 10% transmission and the other 20%—will give sufficient choice.

LIGHT TRANSFER CHARACTERISTIC

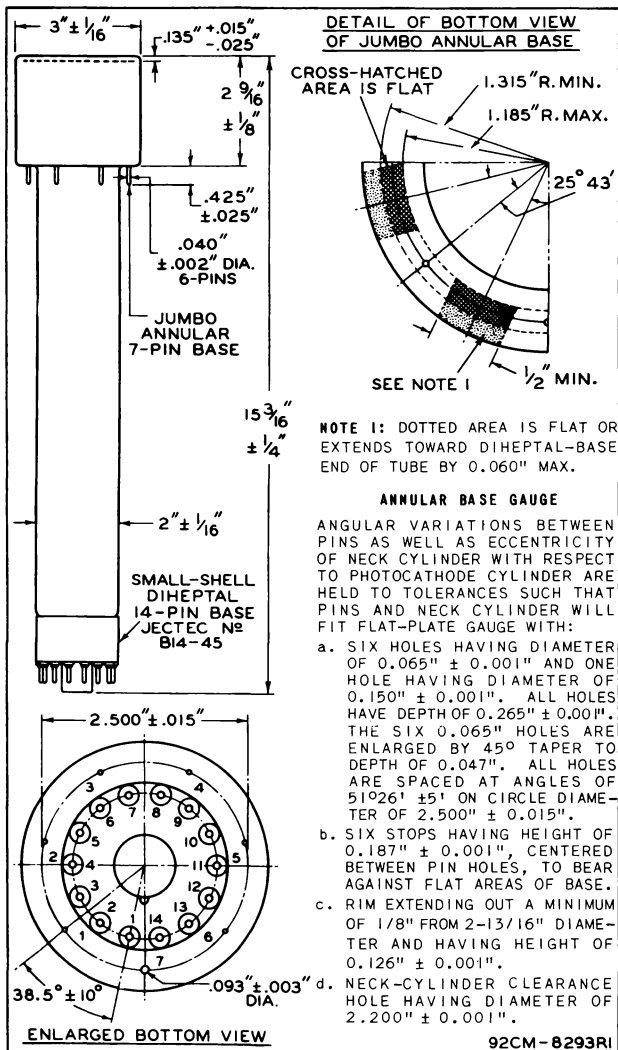




5820

5820

IMAGE ORTHICON



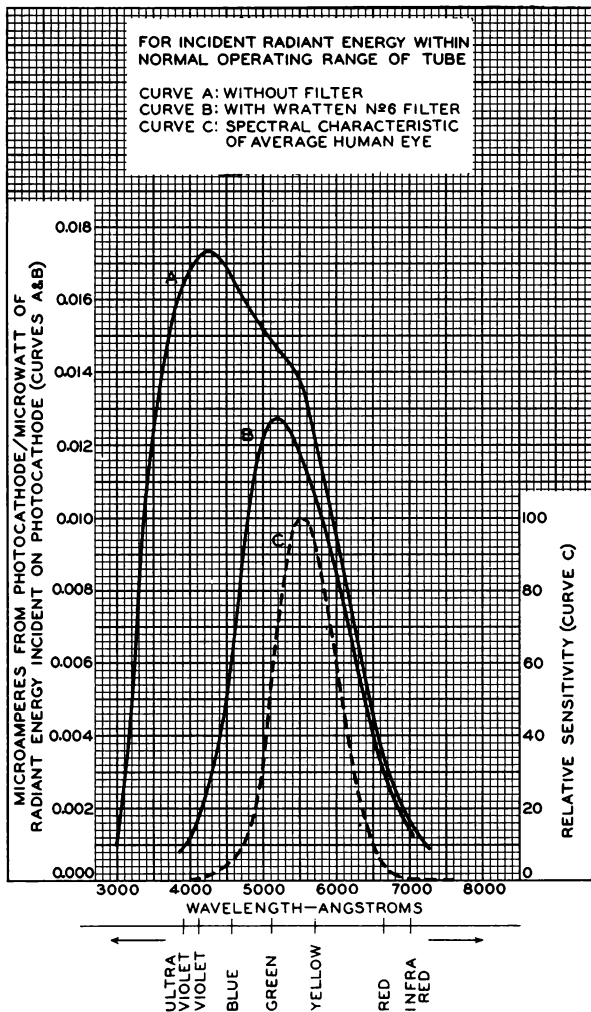
JAN. 3, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8293RI



SPECTRAL SENSITIVITY CHARACTERISTIC WITH AND WITHOUT FILTER





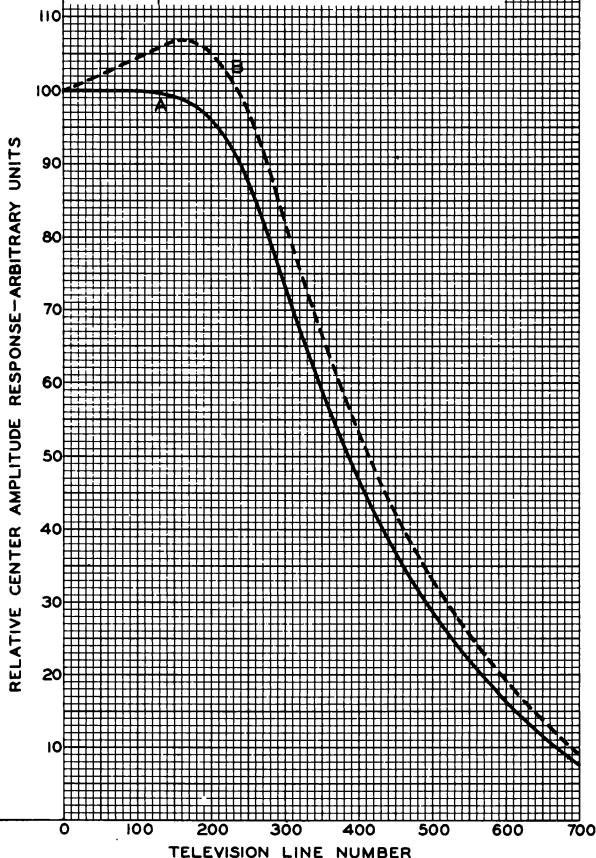
5820

5820

AMPLITUDE RESPONSE CHARACTERISTICS

TEST PATTERN: SQUARE WAVE
OPERATING TEMPERATURE OF BULB
ADJACENT TO TARGET: 35°C
RESPONSE MEASURED IN SYSTEM
HAVING 10-MC BANDWIDTH

CURVE	HIGHLIGHTS IN RELATION TO LIGHT TRANSFER CHARACTERISTIC
A	AT KNEE
B	ONE LENS STOP ABOVE KNEE



SEPT. 23, 1954

TUBE DIVISION

92CM-8439

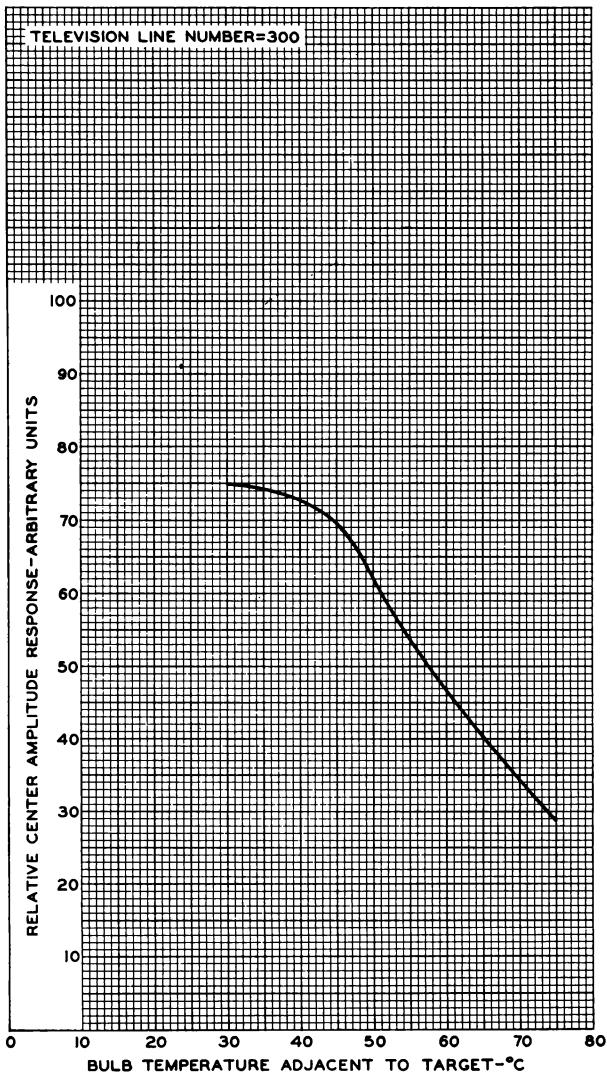
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5820



5820

TEMPERATURE EFFECT ON AMPLITUDE RESPONSE



MAR.15,1954

TUBE DIVISION

92CM-8272

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6198

VIDICON

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitance:

Signal Electrode to All

Other Electrodes 4.5 μmf

Spectral Response See Curve

Photoconductive Layer:

Maximum Useful Diagonal of Rectangular inch

Image (4 x 3 Aspect Ratio) 0.62

Orientation of Quality Rectangle--Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.

Focusing Method Magnetic

Deflection Method Magnetic

Overall Length $6\frac{1}{4} \pm \frac{1}{4}$ "Greatest Diameter (Excluding Side Tip) 1.125 ± 0.010 "

Maximum Radius (Including Side Tip) 0.805"

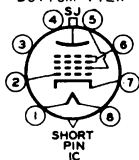
Bulb. T-8

Operating Position Any

Base. Small-Button Ditetrar 8-Pin (JETEC No.E8-11)

BOTTOM VIEW

Pin 1-Heater
 Pin 2-Grid No.1
 Pin 3-Int. Conn.--
 Do Not Use
 Pin 4-Int. Conn.--
 Do Not Use
 Pin 5-Grid No.2
 Pin 6-Grid No.3,
 Grid No.4

DIRECTION OF LIGHT:
INTO FACE END OF TUBE

Pin 7-Cathode
 Pin 8-Heater
 Flange (SJ)-
 Signal
 Electrode
 Short Index Pin-
 Int. Conn.--
 Make No
 Conn.

Maximum Ratings, Absolute Values:

SIGNAL-ELECTRODE VOLTAGE. 125 max. volts

GRID-No.4 & GRID-No.3 VOLTAGE 350 max. volts

GRID-No.2 VOLTAGE 350 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with
 respect to cathode 125 max. voltsHeater positive with
 respect to cathode 10 max. voltsFACEPLATE TEMPERATURE 60 max. $^{\circ}\text{C}$

SEPT. 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6198



6198

VIDICON

Typical Operation and Characteristics:

For scanned area of 1/2" x 3/8"

Signal-Electrode Voltage for		
Dark Current of 0.02 μ amp	10 to 125	volts
Grid-No.4 (Decelerator) & Grid-		
No.3 (Beam Focus) Voltage	200 to 300	volts
Grid-No.2 (Accelerator) Voltage	300	volts
Grid-No.1 Voltage		
(For picture cutoff)	-45 to -100	volts
Signal-Output Current:*		
Normal Operating Range.	0.1 to 0.2	μ amp
Minimum, with 0.6 foot-candle of		
uniform 2870°K tungsten il-		
lumination on tube face	0.02	μ amp
Uniform 2870°K Tungsten Illumi-		
nation on Tube Face to Produce		
Signal-Output Current of		
0.1 to 0.2 μ amp	3 to 10	ft-c
Ratio (Approx.) of Tube-Face Illumi-		
nation Required to Produce Signal-		
Output Current of 0.2 μ amp to That		
Required to Produce 0.02 μ amp	30	
Minimum Peak-to Peak		
Blanking Voltage:		
When applied to grid No.1	30	volts
When applied to cathode	10	volts
Field Strength at Center of		
Focusing Device	40	gausses
Field Strength of Adjustable		
Alignment Coil.	0 to 4	gausses

* Defined as the component of the signal-electrode current after the dark-current component has been subtracted.

OPERATING CONSIDERATIONS

The base pins of the 6198 fit the ditetrar8-pin connector such as Cinch No.54A18088, or equivalent.

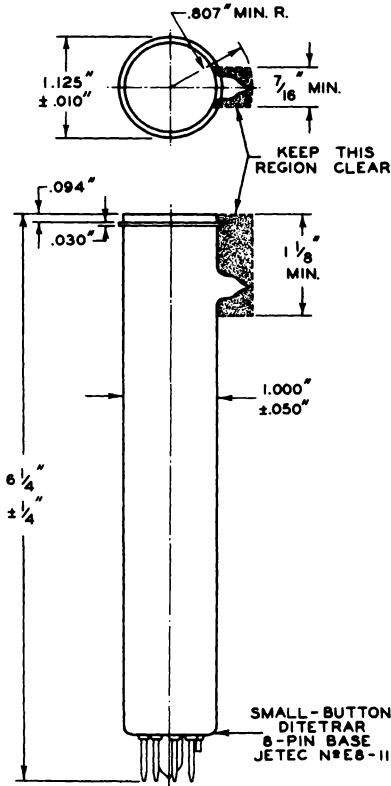
Resolution of better than 350 lines at the center of the picture can be produced by the 6198. To utilize the resolution capability of the 6198 in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 6 megacycles per second. The maximum resolution obtainable is limited by the size of the scanning-beam spot.



6198

VIDICON

6198



92CS-7772

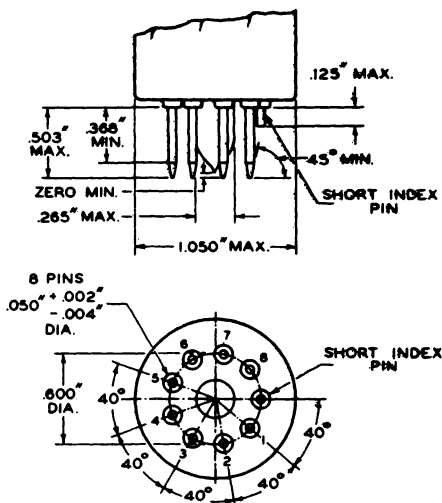
6198



6198

VIDICON

SMALL - BUTTON DITETRAR
8-PIN BASE
JETEC N°E8 - II



92CS - 7765

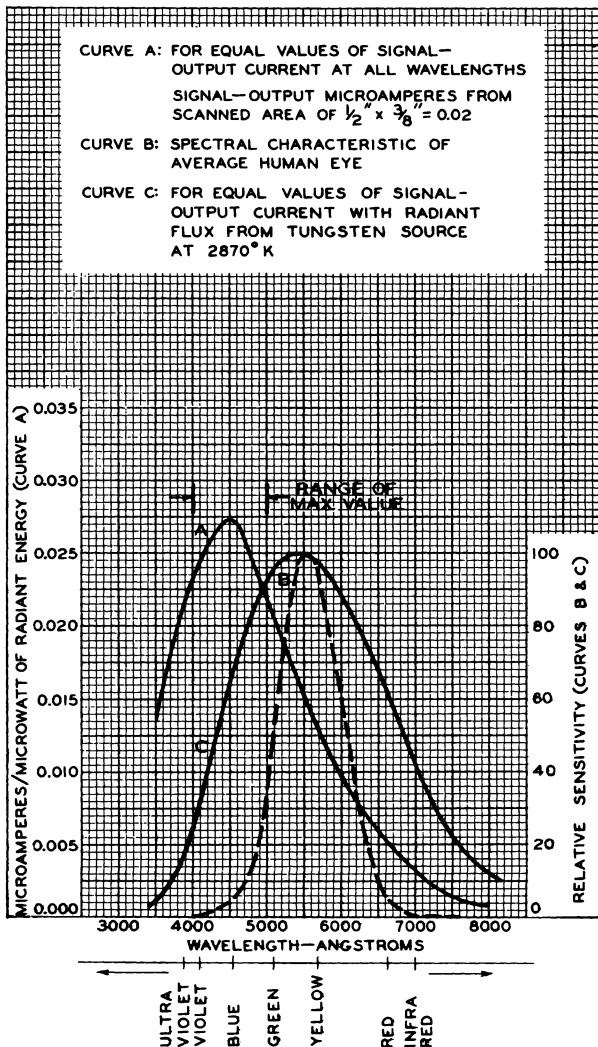
Base-pin positions are held to tolerances such that pins will fit a flat-plate gauge having thickness of $1/8$ " and 9 holes $0.0700" \pm 0.0005"$ so located on a $0.6000" \pm 0.0005"$ diameter circle that the distance along the chord between any two adjacent hole centers is $0.2052" \pm 0.0005"$. Gauge is provided with center hole having diameter of $0.300" \pm 0.001"$ and same center as the pin circle.



6198

6/98

SPECTRAL SENSITIVITY CHARACTERISTIC



JUNE 18, 1952

TUBE DEPARTMENT

92CM-7763R1

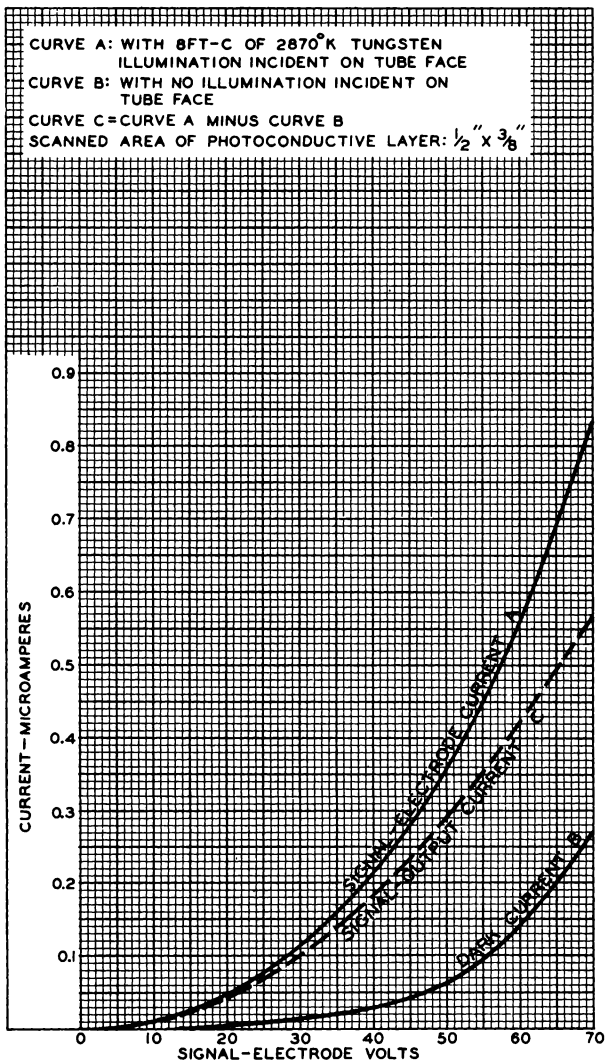
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6198



6198

TYPICAL CHARACTERISTICS



JUNE 17, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

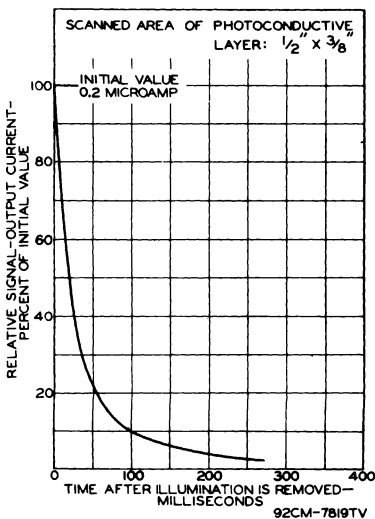
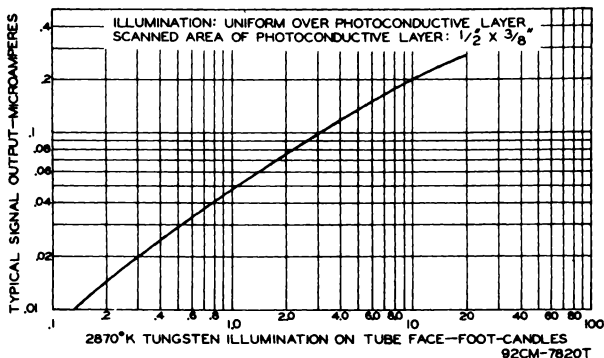
92CM-7818



6198

VIDICON

6198





6326

VIDICON

FOR PICKUP FROM MOTION-PICTURE FILM
600-LINE RESOLUTION

6326

DATA

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts
Current 0.6 amp

Direct Interelectrode Capacitance:†

Signal Electrode to
All Other Electrodes 4.5 μmf

Spectral Response See Curves

Photoconductive Layer:

Maximum Useful Diagonal of Rectangular
Image (4 x 3 Aspect Ratio) 0.62 inchOrientation of Quality Rectangle—Proper orientation is obtained
when the horizontal scan is essentially parallel to the
plane passing through the tube axis and short index pin.

Focusing Method Magnetic

Deflection Method Magnetic

Overall Length $6\text{--}1\frac{1}{4} \pm \frac{1}{4}$ "Greatest Diameter (Excluding side tip) 1.125 ± 0.010 "

Maximum Radius (Including side tip) 0.805"

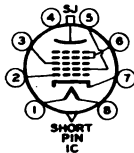
Bulb T-8

Operating Position . . . Approx. horizontal, or faceplate up

Weight (Approx.) 2 oz

Base Small-Button Ditetra 8-Pin. (JETEC No. E8-11)

BOTTOM VIEW

Pin 1: Heater
Pin 2: Grid No. 1
Pin 3: Grid No. 3
Pin 4: Int. Conn.—
Do Not Use
Pin 5: Grid No. 2
Pin 6: Grid No. 4,
Grid No. 5Pin 7: Cathode
Pin 8: Heater
Flange (SJ):
Signal .
Electrode
Short Index Pin:
Int. Conn.—
Make No
ConnectionDIRECTION OF LIGHT:
INTO FACE END OF TUBE

Maximum Ratings, Absolute Values:

SIGNAL-ELECTRODE VOLTAGE 125 max. volts

GRID-No. 5 & GRID-No. 4 VOLTAGE 350 max. volts

GRID-No. 3 VOLTAGE 350 max. volts

GRID-No. 2 VOLTAGE 350 max. volts

GRID-No. 1 VOLTAGE:

Negative bias value 125 max. volts

Positive bias value 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode . . . 125 max. volts

Heater positive with respect to cathode . . . 10 max. volts

† This capacitance, which effectively is the output impedance of the 6326, is increased by about $3 \mu\text{mf}$ when the tube is mounted in the RCA deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

MARCH 1, 1954

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1

6326



6326

VIDICON

FACEPLATE:

Illumination	1000 max.	ft-c
Temperature	60 max.	°C

Typical Operation with Static Focusing:

*Grid No.3 connected to grids No.4 and No.5;
scanned area of 1/2" x 3/8"*

Faceplate Illumination:

Average Highlight [▲] , for pickup from film . . .	100 to 300	ft-c
Constant, for pickup from transparencies or opaques .	10	ft-c

Signal-Electrode Voltage:

For pickup from film	10 to 30	volts
For pickup from transparencies or opaques	30 to 60	volts

Grid-No.5 (Decelerator) and

Grids-No.4 & No.3 (Beam-Focus Electrodes*) Voltage .	200 to 300	volts
--	------------	-------

Grid-No.2 (Accelerator) Voltage . .	300	volts
-------------------------------------	-----	-------

Grid-No.1 Voltage for Picture Cutoff	-45 to -100	volts
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Highlight Signal-Electrode Current .	0.3 to 0.4	μamp
--------------------------------------	------------	------

Average Signal-Output Current [#] . . .	0.1 to 0.2	μamp
--	------------	------

Maximum Dark Current:

For pickup from film	0.004	μamp
For pickup from transparencies or opaques	0.02	μamp

Average "Gamma" of Transfer

Characteristic for signal-output current between 0.02 μamp and 0.2 μamp	0.65	
---	------	--

Visual Equivalent Signal-to-Noise

Ratio (Approx.)[○] 300:1

Minimum Peak-to-Peak Blanking Voltage:

When applied to grid No.1	40	volts
When applied to cathode	10	volts

Field Strength of Adjustable

Alignment Coil	0 to 4	gausses
--------------------------	--------	---------

[▲] Averaged over the time of one TV frame.

* Beam focus is obtained by combined effect of grids-No.4 & No.3 voltage which should be adjustable over indicated range, and RCA-217D1 Focusing Coil with 40 milliamperes passing through it.

[#] Defined as the component of the signal-electrode current after the dark-current component has been subtracted.

[○] For amplifier system of the low-noise cascode type having 8-Mc bandwidth. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.



6326

VIDICON

6326

Typical Operation with Dynamic Focusing:

Grid No.3 used separately as Dynamic Focusing Electrode;
scanned area of $1/2" \times 3/8"$

Values are the same as shown above for *Typical Operation with Static Focusing* except as follows:

Grid-No.5 (Decelerator) and

Grid-No.4 (Beam-Focus

Electrode**) Voltage 200 to 300 volts

Grid-No.3 (Dynamic-Focus

Electrode**) Voltage:

DC value 200 to 300 volts

Peak-to-peak value (Approx.). 60 volts

** Static beam focus is obtained by combined effect of grid-No.4 voltage which should be adjustable over indicated range, and RCA-217D1 Focusing Coil with 40 milliamperes passing through it. Dynamic beam focus to give improved edge focus is supplementary to static beam focus and is accomplished by adjusting the dc grid-No.3 voltage to the same value as that of grid No.4 and by applying to grid No.3 an ac voltage having parabolic waveform.

BASE CONNECTOR

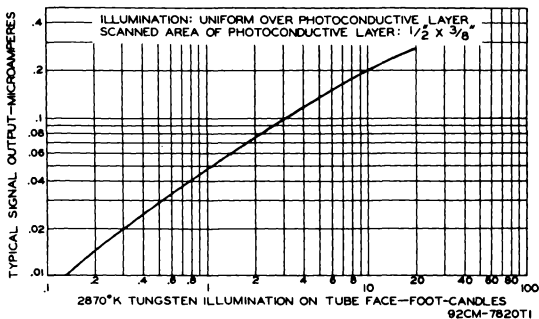
The base pins of the 6326 fit the ditetrar 8-contact connector, such as Cinch No.54A18088, or equivalent.

SPECTRAL SENSITIVITY CHARACTERISTIC,
DIMENSIONAL OUTLINE,

and

BASE DIMENSIONS

are the same as shown for Type 6198

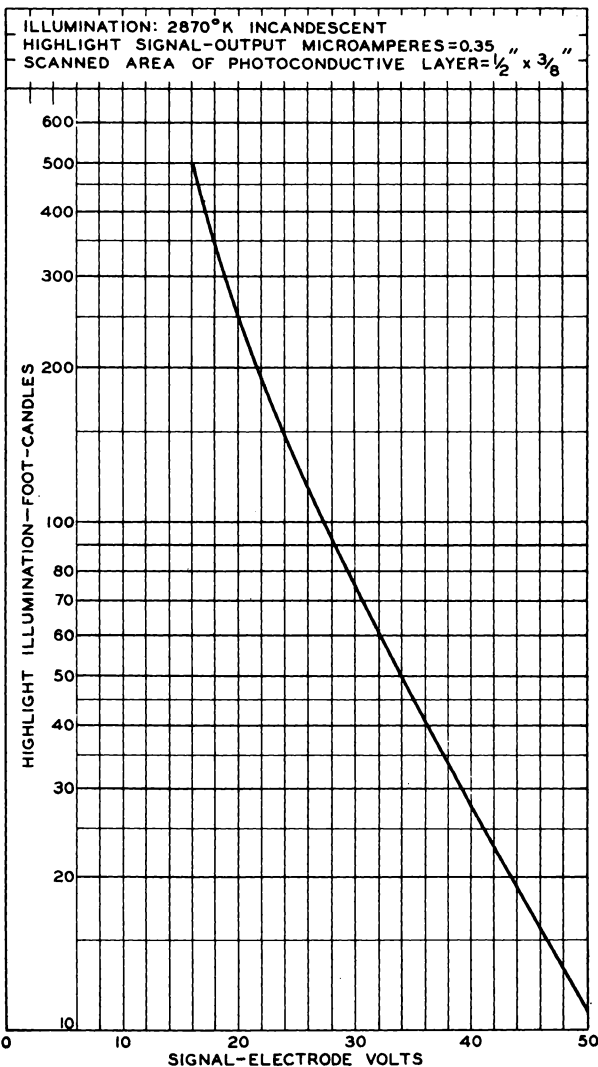


6326



6326

TYPICAL CHARACTERISTIC



OCT. 12, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

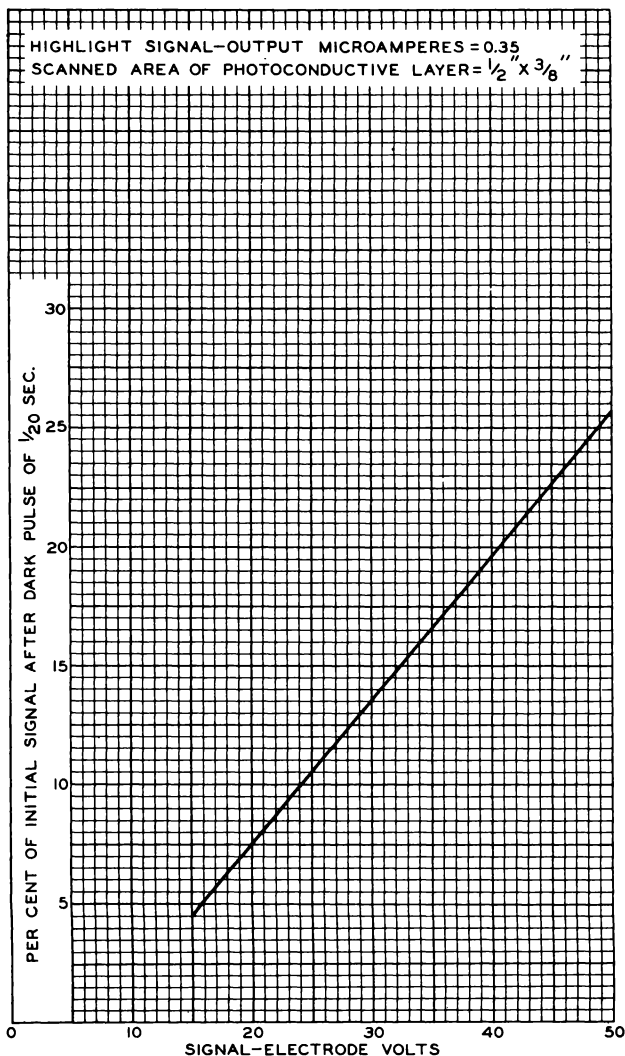
92CM-8118



6326

6326

PERSISTENCE CHARACTERISTIC



OCT. 12. 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8119



6326-A VIDICON

6326-A

600-LINE RESOLUTION
For film and live pickup
with color or black-and-white TV cameras

The 6326-A is an improved version of the 6326 and is unilaterally interchangeable with it.

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 $\pm$ 10% ac or dc volts

Current 0.6 amp

Direct Interelectrode Capacitance:¹

Signal electrode to

all other electrodes. 4.5 μ f

Spectral Response See Curves

Photoconductive Layer:

Maximum useful diagonal of rectangular image (4 x 3 aspect ratio). 0.62"

Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer.

Focusing Method Magnetic

Deflection Method Magnetic

Overall Length. 6-1/4" $\pm$ 1/4"

Greatest Diameter 1.125" $\pm$ 0.010"

Weight (Approx.). 2 oz

Operating Position. Approx. horizontal, or faceplate up

Bulb. T-8

Base Connector. Cinch No. 54A18088, or equivalent

Base. Small-Button Ditetra 8-Pin (JETEC No. E8-11)

Basing Designation for BOTTOM VIEW. 8HL

Pin 1—Heater

Pin 2—Grid No. 1

Pin 3—Grid No. 3

Pin 4—Internal

Connection—
Do Not Use

Pin 5—Grid No. 2

Pin 6—Grid No. 4,

Grid No. 5

Pin 7—Cathode

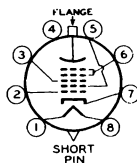
Pin 8—Heater

Flange—Signal
Electrode

Short Index Pin—
Internal

Connection—
Make No

Connection



DIRECTION OF LIGHT:
INTO FACE END OF TUBE

Maximum Ratings, Absolute Values:

SIGNAL-ELECTRODE VOLTAGE. 100 max. volts

GRID-No. 5 & GRID-No. 4 VOLTAGE 350 max. volts

¹ This capacitance, which effectively is the output impedance of the 6326-A, is increased by about 3 μ f when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.



VIDICON

GRID-No.3 VOLTAGE	350 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with		
respect to cathode.	125 max.	volts
Heater positive with		
respect to cathode.	10 max.	volts
FACEPLATE:		
Illumination.	1000 max.	ft-c
Temperature	60 max.	°C

Typical Operation with Static Focusing:

*Grid No.3 connected to grids No.4 and No.5;
scanned area of 1/2" x 3/8"*

Faceplate Illumination:

Average highlight [▲] , for		
pickup from film.	50 to 300	ft-c
Constant highlight,		
for pickup from limited-		
motion live scenes.	20	ft-c

Signal-Electrode Voltage:

For pickup from film.	20 to 40	volts
For pickup from limited-motion		
live scenes	40 to 70	volts

Grid-No.5 (Decelerator) and

Grids-No.4 & No.3 (Beam-Focus		
Electrodes*) Voltage.	200 to 300	volts

Grid-No.2 (Accelerator) Voltage	300	volts
---	-----	-------

Grid-No.1 Voltage for

Picture Cutoff [●]	-45 to -100	volts
---------------------------------------	-------------	-------

Highlight Signal-Electrode Current.	0.3 to 0.4	μamp
---	------------	------

Average Signal-Output Current [#]	0.1 to 0.2	μamp
--	------------	------

Peak Signal-Output Current.	0.3 to 0.4	μamp
-------------------------------------	------------	------

Maximum Dark Current:

For pickup from film.	0.004	μamp
For pickup from limited-motion		
live scenes	0.02	μamp

Average "Gamma" of Transfer

Characteristic for signal-output		
current between 0.02 μamp and		
0.2 μamp.	0.65	

Visual Equivalent Signal-to-Noise

Ratio (Approx.) [○]	300:1	
--	-------	--

Minimum Peak-to-Peak Blanking Voltage:

When applied to grid No.1	40	volts
When applied to cathode	10	volts

Field Strength of Adjustable

Alignment Coil.	0 to 4	gausses
-------------------------	--------	---------

▲, *, ●, #, ○: See next page.



6326-A

VIDICON

6326-A

Typical Operation with Dynamic Focusing:

Grid No.3 used separately as Dynamic Focusing Electrode;
scanned area of $1/2" \times 3/8"$

Values are the same as those shown for Typical Operation with Static Focusing except as follows:

Grid-No.5 (Decelerator) and Grid-No.4

(Beam-Focus Electrode**) Voltage 200 to 300 volts

Grid-No.3 (Dynamic-Focus

Electrode**) Voltage:

DC value 140 to 240 volts

Peak-to-peak value (Approx.) 60 volts

▲ Averaged over the time of one TV frame.

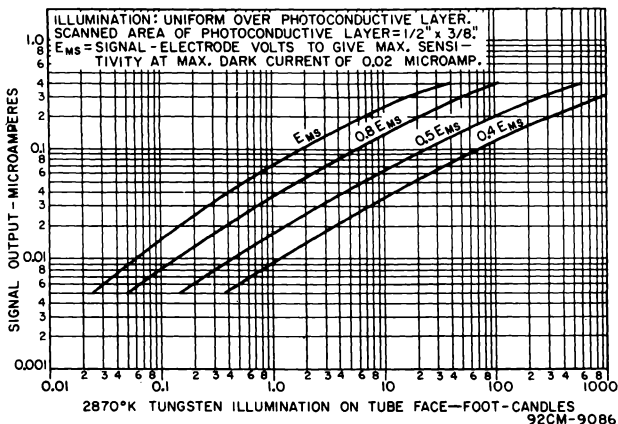
* Beam focus is obtained by combined effect of grids-No.4 & No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gaussess.

● With no blanking voltage on grid No.1.

Defined as the component of the signal-electrode current after the dark-current component has been subtracted.

o For amplifier system of the low-noise cascode type having 8-Mc bandwidth. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

** Static beam focus is obtained by combined effect of grid-No.4 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gaussess. Dynamic beam focus to give improved edge focus is supplementary to static beam focus and is accomplished by adjusting the dc grid-No.3 voltage to a value about 60 volts lower than that of grid No.4 and by applying to grid No.3 an ac voltage having parabolic waveform.

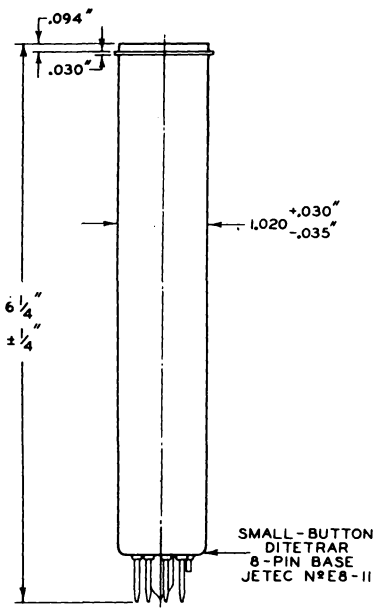
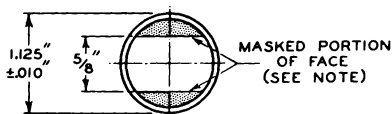
TYPICAL LIGHT TRANSFER CHARACTERISTICS

6326-A



6326-A

VIDICON



92CS-9081

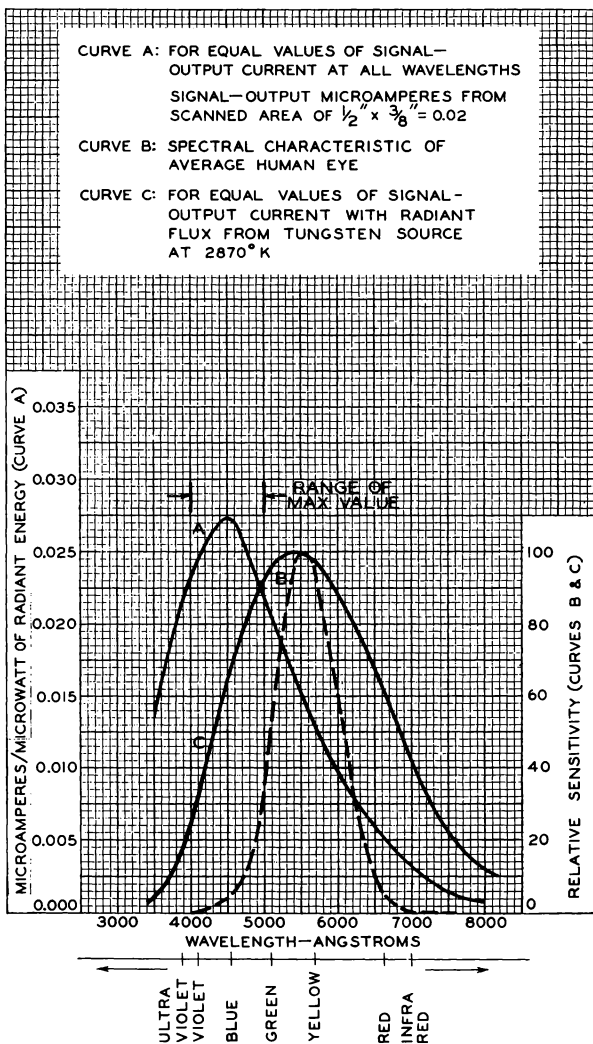
NOTE: STRAIGHT SIDES OF MASKED PORTIONS ARE PARALLEL TO THE PLANE PASSING THROUGH TUBE AXIS AND SHORT INDEX PIN.



6326-A

6326-A

SPECTRAL SENSITIVITY CHARACTERISTICS

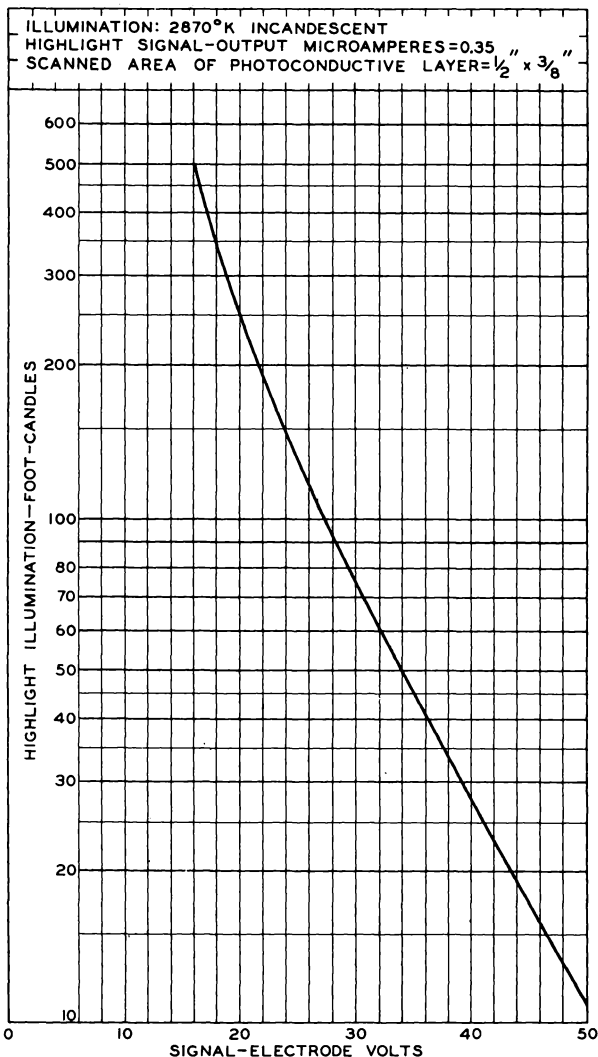


6326-A



6326-A

TYPICAL CHARACTERISTIC



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

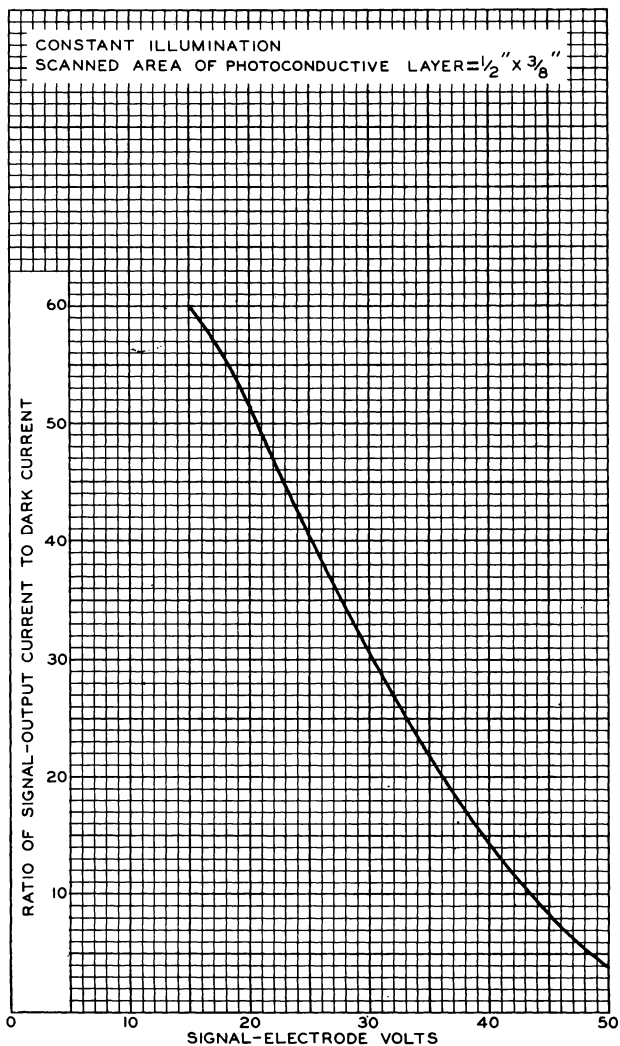
92CM-8118



6326-A

TYPICAL CHARACTERISTIC

6326-A

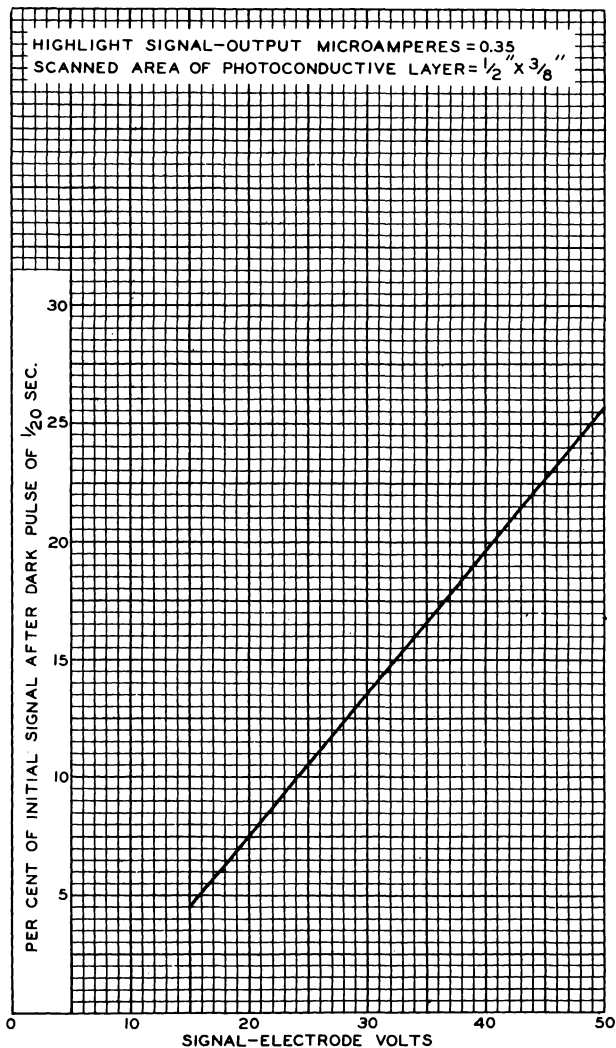


6326-A



6326-A

PERSISTENCE CHARACTERISTIC



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8119



6474/1854

IMAGE ORTHICON

FOR SIMULTANEOUS COLOR PICKUP

MAGNETIC FOCUS

MAGNETIC DEFLECTION

6474

DATA

General:

Heater, for Unipotential Cathode:

Voltage $6.3 \pm 10\%$ ac or dc volts

Current 0.6 ampere

Direct Interelectrode Capacitance:

Anode to all other electrodes 20 μf

Photocathode, Semitransparent:

Response See accompanying Spectral Sensitivity curve

Rectangular image (4 x 3 aspect ratio):

Useful size of 1.6" max. Diagonal

Orientation of Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through center of faceplate and pin No.7 of the shoulder base.

Focusing Method Magnetic

Deflection Method Magnetic

Overall Length $15-3/16" \pm 1/4"$ Greatest Diameter of Bulb $3" \pm 1/16"$ Minimum Deflecting-Coil Inside Diameter $2-3/8"$

Deflecting-Coil Length 5"

Focusing-Coil Length 10"

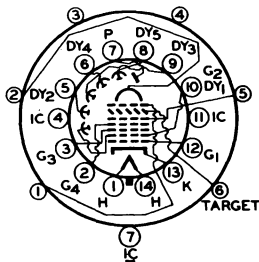
Alignment-Coil Length $15/16"$ Photocathode Distance Inside End of Focusing Coil $1/2"$ Operating Position: Any except with diheptal base up and tube axis at angle of less than 20° from vertical

Weight (Approx.) 1 lb 6 oz

End Base Small-Shell Diheptal 14-Pin Base (JETEC No. B14-45)

BOTTOM VIEW

- Pin 1—Heater
- Pin 2—Grid No.4
- Pin 3—Grid No.3
- Pin 4—Internal Connection—Do Not Use
- Pin 5—Dynode No.2
- Pin 6—Dynode No.4
- Pin 7—Anode
- Pin 8—Dynode No.5
- Pin 9—Dynode No.3
- Pin 10—Dynode No.1, Grid No.2
- Pin 11—Internal Connection—Do Not Use
- Pin 12—Grid No.1
- Pin 13—Cathode
- Pin 14—Heater

DIRECTION OF LIGHT:
PERPENDICULAR TO
LARGE END OF TUBEWHITE INDEX LINE
ON FACE

(Continued on next page)

JUNE 14, 1954

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6474



6474

IMAGE ORTHICON

Shoulder Base	Keyed Jumbo Annular 7-Pin
Pin 1—Grid No.6	Pin 5—Grid No.5
Pin 2—Photocathode	
Pin 3—Internal Connection—Do Not Use	Pin 6—Target
Pin 4—Internal Connection—Do Not Use	Pin 7—Internal Connection—Do Not Use

Maximum Ratings, Absolute Values:

PHOTOCATHODE:		
Voltage	-550 max.	volts
Illumination	50 max.	ft-c
OPERATING TEMPERATURE:		
Of any part of bulb	50 max.	°C
Of bulb at large end of tube (target section)	35 min.	°C
TEMPERATURE DIFFERENCE:		
Between target section and any part of bulb hotter than target section . .	5 max.	°C
GRID-No.6 VOLTAGE	-550 max.	volts
TARGET VOLTAGE:		
Positive value	10 max.	volts
Negative value	10 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	125 max.	volts
Heater positive with respect to cathode .	10 max.	volts
ANODE-SUPPLY VOLTAGE*	1350 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation and Characteristics:

Photocathode Voltage (Image Focus) . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 75% of photocathode voltage	-225 to -375	volts
Target Voltage ^o	0 to 3	volts
Grid-No.5 Voltage (Decelerator)	0 to 125	volts
Grid-No.4 Voltage (Beam Focus)	160 to 220	volts
Grid-No.3 Voltage [#]	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff .	-45 to -115	volts

* Ratio of dynode voltages is shown under *Typical Operation*.^o Adjustable from -3 to +5 volts with blanking voltage off.[#] Adjust to give the most uniformly shaded picture near maximum signal.



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IMAGE ORTHICON

Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Anode Current (DC)	30	μ amp
Signal-Output Current (Peak to peak)	3 to 20	μ amp
Target Temperature Range	35 to 45	$^{\circ}$ C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.)	60	
Minimum Peak-to-Peak Blanking Voltage	5	volts
Field Strength at Center of Focusing Coil [▲]	75	gausses
Field Strength of Alignment Coil (Approx.)	0 to 3	gausses

[▲] Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.

OPERATING CONSIDERATIONS

When the equipment design or operating conditions are such that the *maximum temperature rating* or *maximum temperature difference* as given under *Maximum Ratings* will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting-coil assembly and its extension. Any attempt to effect cooling of the tube by circulating even a large amount of air around the focusing coil will do little good, but a small amount of air directly in contact with the bulb surface will effectively drop the bulb temperature. For this purpose, a small blower is satisfactory, but it should be run at low speed to prevent vibration of the 6474 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur.

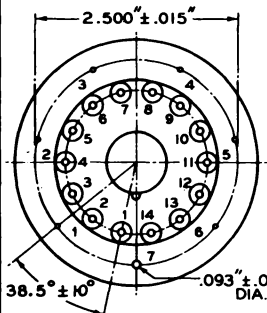
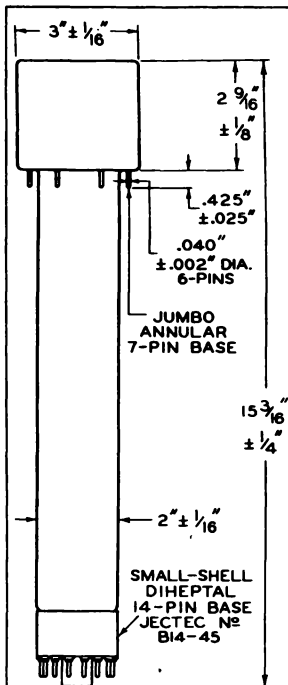
To keep the operating temperature of the large end of the tube from falling below 35° C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface. If, in special cases, a target heater is required, it should fit between the focusing coil and the bulb near the shoulder of the tube, and be non-inductively wound.

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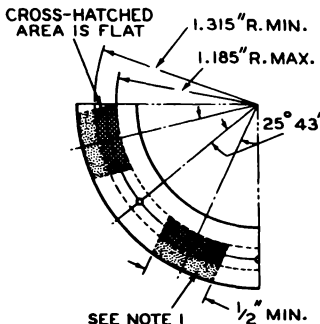


6474

IMAGE ORTHICON



ENLARGED BOTTOM VIEW

DETAIL OF BOTTOM VIEW
OF JUMBO ANNULAR BASE

NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY $0.060''$ MAX.

ANNULAR BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- SIX HOLES HAVING DIAMETER OF $0.065'' \pm 0.001''$ AND ONE HOLE HAVING DIAMETER OF $0.150'' \pm 0.001''$. ALL HOLES HAVE DEPTH OF $0.265'' \pm 0.001''$. THE SIX $0.065''$ HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF $0.047''$. ALL HOLES ARE SPACED AT ANGLES OF $51^\circ 26' \pm 5'$ ON CIRCLE DIAMETER OF $2.500'' \pm 0.015''$.
- SIX STOPS HAVING HEIGHT OF $0.187'' \pm 0.001''$, CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.
- RIM EXTENDING OUT A MINIMUM OF $\frac{1}{8}''$ FROM $2-13/16''$ DIAMETER AND HAVING HEIGHT OF $0.126'' \pm 0.001''$.
- NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF $2.200'' \pm 0.001''$.

92CM-8293

JUNE 14, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

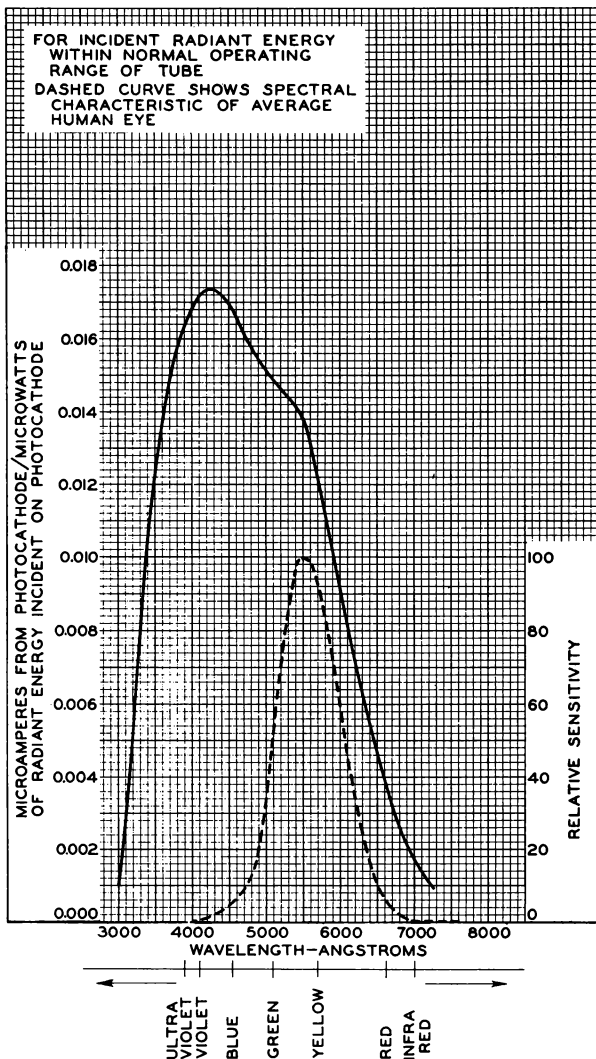
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SPECTRAL SENSITIVITY CHARACTERISTIC



MAR. 15, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

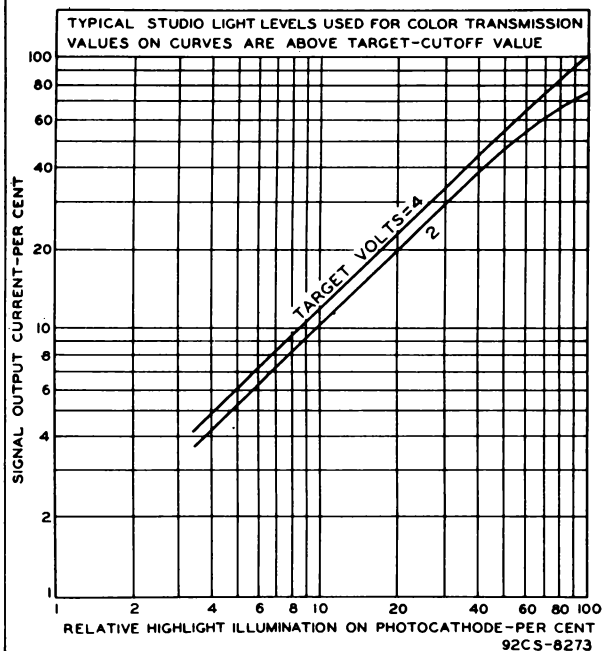
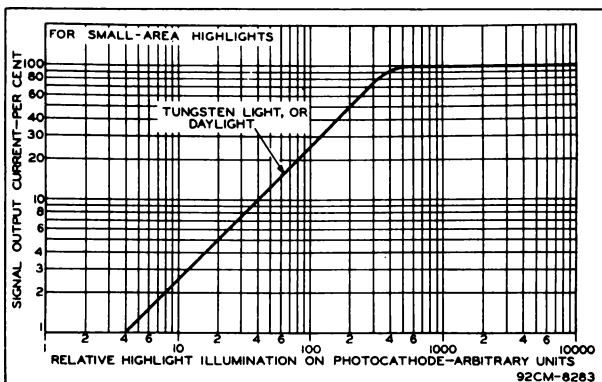
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LIGHT TRANSFER CHARACTERISTICS



JUNE 14, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

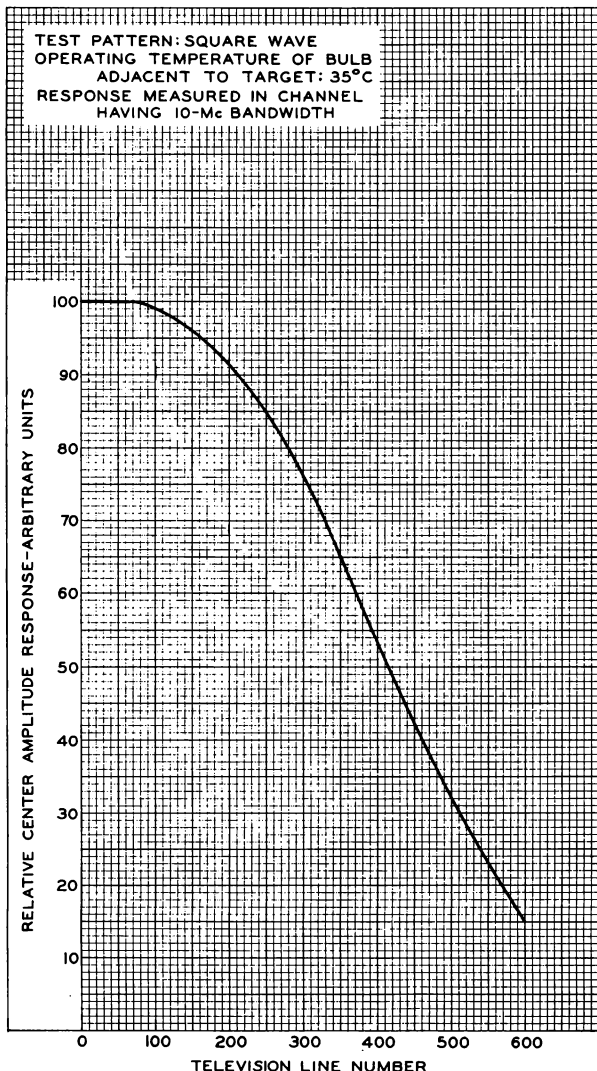
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AMPLITUDE RESPONSE CHARACTERISTIC



MAR. 15, 1954

TUBE DIVISION

92CM-8271

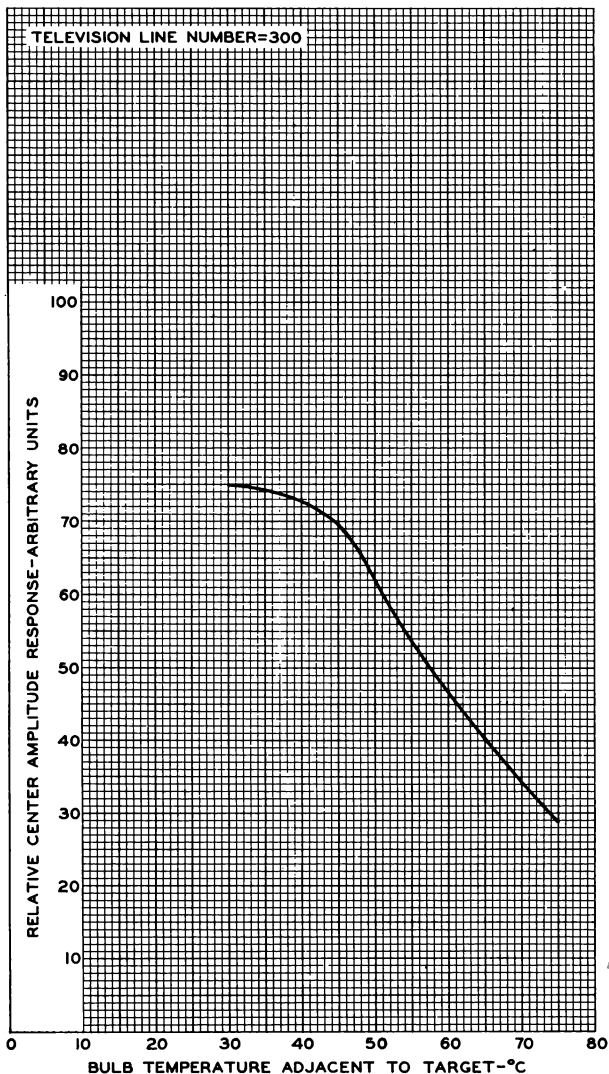
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TEMPERATURE EFFECT ON AMPLITUDE RESPONSE



MAR.15,1954

TUBE DIVISION

92CM-8272

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



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COMPUTER STORAGE TUBESINGLE-BEAM, PRIMARY-CURRENT-MODULATION TYPE
REDISTRIBUTION WRITING CAPACITANCE-DISCHARGE READING**DATA****General:**

Heater, for Unipotential Cathode:

Voltage. 6.3 ac or dc volts
Current. 0.6 amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes.	6.5	μmf
Grid No.1 to deflecting electrode DJ_1 . . .	0.2	μmf
Grid No.1 to deflecting electrode DJ_2 . . .	0.2	μmf
Grid No.1 to deflecting electrode DJ_3 . . .	0.2	μmf
Grid No.1 to deflecting electrode DJ_4 . . .	0.2	μmf
Cathode to all other electrodes.	5	μmf
DJ_1 to DJ_2	2.8	μmf
DJ_3 to DJ_4	2.6	μmf
DJ_1 to all other electrodes.	9	μmf
DJ_2 to all other electrodes.	9	μmf
DJ_3 to all other electrodes.	8	μmf
DJ_4 to all other electrodes.	7	μmf

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Deflecting-electrode

arrangement. *See Dimensional Outline*

Storage Surface. On inner surface of faceplate

Signal-Output Electrode. Metal plate or 50-line (minimum) mesh covering external surface of faceplate and capacitively coupled to the storage surface. (This electrode is not supplied with the tube).

Overall Length 11-1/2" $\pm$ 1/4"Greatest Diameter of Bulb. 3" $\pm$ 1/16"

Weight (Approx.) 9 oz

Mounting Position. Center of tube face must be at same elevation as or at higher elevation than tube base.

Cap. Recessed Small Cavity (JETEC No.J1-21)

Base Small-Shell Duodecal 10-Pin (JETEC No.B10-75)

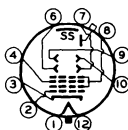
BOTTOM VIEW

Pin 1-Heater

Pin 2-Grid No.1

Pin 3-Cathode

Pin 4-Grid No.3

Pin 6-Deflecting
Electrode DJ_4 Pin 7-Deflecting
Electrode DJ_3 Pin 8-Ultor (Grids
No.2 & No.4)

Pin 9-Deflecting

Electrode DJ_2

Pin 10-Deflecting

Electrode DJ_1

Pin 12-Heater

Cap-Collector

SS-Storage
Surface[▲][▲] The Signal-Output Electrode is capacitively coupled to the Storage Surface.

MAY 1, 1955

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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COMPUTER STORAGE TUBE

Maximum Ratings, Design-Center Values:

COLLECTOR VOLTAGE:

Difference between collector

voltage and ultor voltage. 150 max. volts

ULTOR* VOLTAGE 2500 max. volts

GRID-No.3 VOLTAGE. 1000 max. volts

GRID-No.1 VOLTAGE:

Negative bias value. 200 max. volts

Positive bias value. 0 max. volts

Positive peak value. 2 max. volts

PEAK VOLTAGE BETWEEN ULTOR AND

ANY DEFLECTING ELECTRODE 500 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode 125 max. volts

Heater positive with respect to cathode 125 max. volts

Equipment Design Ranges:

For any ultor voltage (E_{c4}) between 1000 and 2500 volts

Collector Voltage. 95% to 105% of E_{c4} volts

Grid-No.3 Voltage. 20% to 28% of E_{c4} volts

Max. Grid-No.1 Voltage for Beam-Current Cutoff 2.4% of E_{c4} volts

Max. Grid-No.3 Current Range. -15 to +10 μ amp

Deflection Factors:

DJ1 & DJ2. 39 to 53 v dc/in./kv of E_{c4}

DJ3 & DJ4. 35.5 to 48.5 v dc/in./kv of E_{c4}

Focused-Beam Position. ##

Examples of Use of Design Ranges:

For ultor voltage of 1000 2500 volts

Collector Voltage. 950 to 1050 2375 to 2625 volts

Grid-No.3 Voltage. 200 to 280 500 to 700 volts

Max. Grid-No.1 Voltage for Beam-Current Cutoff -24 -60 volts

Deflection Factors:

DJ1 & DJ2. 39 to 53 97.5 to 133 volts dc/in.

DJ3 & DJ4. 35.5 to 48.5 89 to 122 volts dc/in.

- The "ultor" in a storage tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 6571, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 6571, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

- ## The center of the undeflected focused beam will fall within a circle having a 7.5-mm radius concentric with the center of the tube face.



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COMPUTER STORAGE TUBE**Storage Characteristics for Ultor Voltage of 2500 Volts:**Storage-Surface Boundary (In terms of
deflection voltage):In the DJ₁-DJ₂ direction from posi-
tion of undeflected focused beam . . ±109 voltsIn the DJ₃-DJ₄ direction from posi-
tion of undeflected focused beam . . ±100 voltsBlemish Factor*, for storage surface
within indicated boundary. 0.5 max.

Spill (Determined for Double-Dot Pattern):**

*Under conditions involving 255 references to "spill" element
and 1 reference to "test" element*Separation Between Storage Elements,
in either the DJ₁-DJ₂ or DJ₃-DJ₄
direction in terms of deflection
voltage:

At center of storage surface 8 max. volts

At midpoint on each side of
storage-surface boundary 10 max. volts**Maximum Circuit Values:**

Grid-No.1-Circuit Resistance 1.5 max. megohms

Resistance in Any Deflecting-
Electrode Circuit[■] 1.0 max. megohm* Blemish factor is defined as the factor by which the normal positive
signal is reduced by the blemish.** Spill is indicative of the amount of binary information that can be
stored by the tube. The storage capability is determined by the sepa-
ration between two storage elements at which the signal from one
element is changed by no more than a specified amount after repeated
references to the other element. For the 6571, the separation is
measured, in terms of deflection voltage, when the amplitude of the
negative signal of the "test" element has decreased to 50% of its
maximum negative amplitude. The maximum negative amplitude is deter-
mined by separating the two elements far enough to eliminate the
effects of secondary electron redistribution from the "spill" element.■ It is recommended that the deflecting-electrode-circuit resistances
be approximately equal.**OPERATING CONSIDERATIONS**

Shielding. In typical computer applications, the 6571
is mounted in a compartment having effective magnetic and
electrostatic shielding. It is recommended that the bulb
be provided with a tight-fitting electrostatic shield ex-
tending from the base to the collector coating. (See
Dimensional Outline). This external shield supplements
the shielding action of the collector in preventing cross-
coupling between the electron gun and the external signal
electrode.

A *signal-output electrode* shaped to conform with the
external contour of the faceplate and placed in contact
with the entire area of the faceplate is required. The
signal-output electrode is connected to a low-noise video

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COMPUTER STORAGE TUBE

amplifier having sufficient gain to amplify signals from a fraction of a millivolt to the desired level.

The *amount of information that can be stored by the 6571* is dependent on the manner in which it is operated, and is affected by the stability of the deflecting system, freedom from noise in the associated output circuit, the number of regenerations compared with the number of addresses, and the effectiveness of the electrostatic and magnetic shielding.

In general, the number of storage elements is proportional to the operating ultor voltage. For the greatest number of storage elements, the 6571 should be operated at the rated maximum ultor voltage and so that the peak grid-No. 1 drive is less than that required for the maximum positive amplitude but high enough to provide a satisfactory output signal.

It is recommended that the beam current be limited to the minimum value which provides satisfactory signal amplitude.

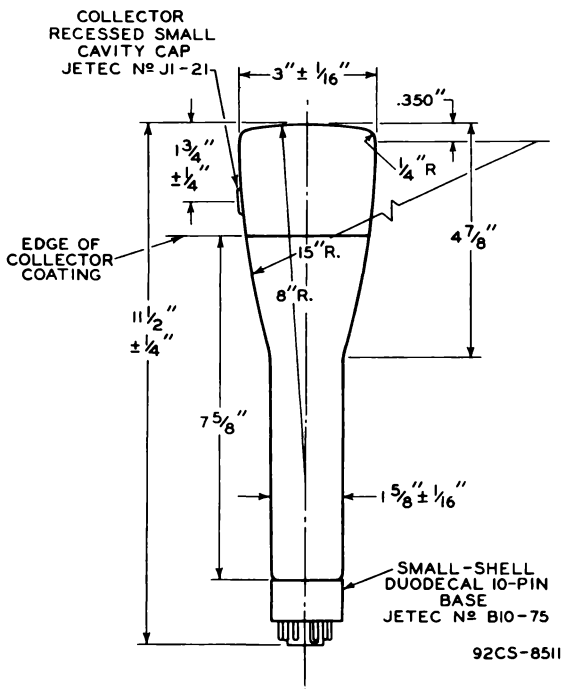
The *storage characteristics* in the tabulated data and curve are based on the use of a double-dot pattern. In this method of storage, the positive signal is produced by adjusting the beam current and the distance between two dot storage elements so that the optimum positive signal is produced when the "test" element is addressed. Other methods of storage such as superimposed focused and defocused spots or dots and dashes may be used equally well with the 6571.



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COMPUTER STORAGE TUBE



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

DJ₁ AND DJ₂ ARE NEARER THE STORAGE SURFACE: DJ₃ AND DJ₄ ARE NEARER THE BASE. WITH DJ₁ POSITIVE WITH RESPECT TO DJ₂, THE BEAM WILL BE DEFLECTED TOWARD PIN 2; LIKEWISE, WITH DJ₃ POSITIVE WITH RESPECT TO DJ₄, THE BEAM WILL BE DEFLECTED TOWARD VACANT PIN POSITION 11.

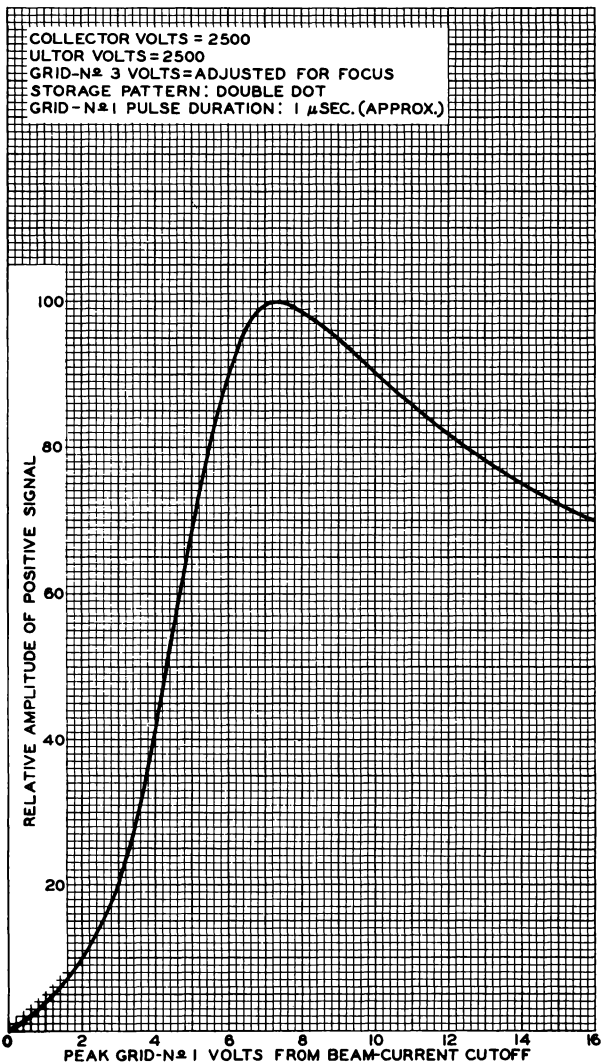
THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ₁ AND DJ₂ BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 2, 10° ; SIDE TERMINAL (ON SAME SIDE AS PIN 8), 10° . ANGLE BETWEEN DJ₁-DJ₂ DEFLECTION PATH AND DJ₃-DJ₄ DEFLECTION PATH IS $90^\circ \pm 3^\circ$.

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AVERAGE CHARACTERISTIC



JAN. 27, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8510



6866

DISPLAY STORAGE TUBE

DIRECT-VIEW TYPE
4"-DIAMETER DISPLAY

NON-EQUILIBRIUM WRITING GRID-CONTROL READING (VIEWING)

6866

DATA

General:

Writing Section Viewing Section

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3	6.3	volts
Current	0.6	0.6	amp

Minimum Cathode Heating Time

before other electrode volt- ages are applied.	-	30	sec
---	---	----	-----

Direct Interelectrode

Capacitances (Approx.):^o

Grid No. 1 to all other tube electrodes	6	18	μft
--	---	----	----------------

Cathode to all other tube electrodes	4.2	6.5	μft
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Deflecting electrode DJ ₁ to deflecting electrode DJ ₂ . . .	1.8	-	μft
---	-----	---	----------------

Deflecting electrode DJ ₃ to deflecting electrode DJ ₄ . . .	1.8	-	μft
---	-----	---	----------------

DJ ₁ to all other tube electrodes.	7.5	-	μft
---	-----	---	----------------

DJ ₂ to all other tube electrodes.	8	-	μft
---	---	---	----------------

DJ ₃ to all other tube electrodes.	6	-	μft
---	---	---	----------------

DJ ₄ to all other tube electrodes.	7	-	μft
---	---	---	----------------

Focusing Method Electrostatic None

Deflection Method Electrostatic None

Deflecting-Electrode Arrangement. *See Dimensional Outline* -Phosphor. - High-Visual-Efficiency Type,
Aluminized

Fluorescence - Yellow

Phosphorescence. - Yellow

Minimum Useful Screen Diameter. 4"

Maximum Overall Length. 15-1/2"

Seated Length 14" $\pm$ 3/8"

Maximum Tube Radius 3-5/32"

Bulb-Flange Diameter. 5-1/8" $\pm$ 1/16"Greatest Bulb Diameter. 5" $\pm$ 1/16"

Bulb Terminals:

Caps (Two). Recessed Small Cavity (JETEC No. J1-21)

Flange. *See Dimensional Outline*Flexible cable. *See Dimensional Outline*

Ambient-Temperature Range -65° to +100 °C

Mounting Position Any

Weight (Approx.). 2 lbs

Socket. Alden Part No. 435SBA, or equivalent

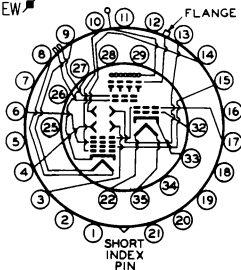
Base. Small-Button Thirtyfive 31-Pin (JETEC No. E31-36)

^o without external shield.



DISPLAY STORAGE TUBE

BOTTOM VIEW



- Pin 1—No Connection
- Pin 2—Same as Pin 1
- Pin 3—Deflecting Electrode DJ₄ of Writing Gun
- Pin 4—Deflecting Electrode DJ₃ of Writing Gun
- Pin 5—Same as Pin 1
- Pin 6—Grid No.3 of Writing Gun
- Pin 7—Same as Pin 1
- Pin 8—Heater of Writing Gun
- Pin 9—Heater of Writing Gun
- Pin 10—Grid No.1 of Writing Gun
- Pin 11—Same as Pin 1
- Pin 12—Same as Pin 1
- Pin 13—Deflecting Electrode DJ₁ of Writing Gun
- Pin 14—Deflecting Electrode DJ₂ of Writing Gun
- Pin 15—Grid No.2 of Writing Gun
- Pin 16—Internal Connection—Do Not Use
- Pin 17—Grid No.4 of Writing Gun, Grid No.2 of Viewing Gun
- Pin 18—Same as Pin 1
- Pin 19—Same as Pin 1
- Pin 20—Same as Pin 16
- Pin 21—Same as Pin 1

- Pin 22—Heater of Viewing Gun
- Pin 25—Same as Pin 1
- Pin 26—Same as Pin 1
- Pin 27—Cathode of Writing Gun
- Pin 28—Same as Pin 1
- Pin 29—Same as Pin 1
- Pin 32—Grid No.1 of Viewing Gun
- Pin 33—Cathode of Viewing Gun
- Pin 34—Same as Pin 1
- Pin 35—Heater of Viewing Gun
- Flexible Cable—Connection to Screen
- Flange—Backing—Electrode
- Recessed Cavity Cap—*Nearer Tube Face*—Grid No.4 of Viewing Gun
- Nearer Electron Guns*—Grid No.3 of Viewing Gun

Maximum Ratings, Absolute Values:

Writing Section Viewing Section**

SCREEN VOLTAGE	—	11000 max.	volts
PEAK BACKING-ELECTRODE VOLTAGE	—	20 max	volts

* pins 23 and 31 are not shown because they are trimmed to the same dimension as the short index pin and are not to be used.

** See next page.



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DISPLAY STORAGE TUBE

	Writing Section	Viewing Section**	
<i>Equivalent Values</i>			
GRID-No.4 VOLTAGE	2900 max.*	150 max.**	300 max. volts
GRID-No.3 VOLTAGE	1000 max.*	—	300 max. volts
GRID-No.2 VOLTAGE	2750 max.*	—	150 max. volts
CATHODE VOLTAGE	—	-2900 max.**	— volts
GRID-No.1 VOLTAGE:			
Negative bias value . .	200 max.*	100 max.	volts
Positive bias value . .	0 max.*	0 max.	volts
Positive peak value . .	2 max.*	0 max.	volts
PEAK VOLTAGE BETWEEN			
GRID No.4 AND ANY			
DEFLECTING ELECTRODE. .	500 max.	—	volts
PEAK HEATER-CATHODE			
VOLTAGE:			
Heater negative with			
respect to cathode. .	125 max.*	125 max.	volts
Heater positive with			
respect to cathode. .	125 max.*	125 max.	volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

Screen Voltage	5000	10000	10000	volts
DC Backing-Electrode				
Voltage	5	5	5	volts
Grid-No.4 Voltage	150	210	150	volts
Grid-No.3 Voltage [#]	25 to 125	50 to 150	25 to 125	volts
Grid-No.2 Voltage [†]	50 to 75	70 to 105	50 to 75	volts
Grid-No.1 Voltage [#]	0 to -50	0 to -75	0 to -50	volts
Maximum Screen Current. . .	350	600	350	μamp
Maximum Peak Backing-				
Electrode Current	1.5	2	1.5	ma
Maximum Grid-No.4 Current [•]	2	3	2	ma
Maximum Grid-No.3 Current [•]	1.5	2	1.5	ma
Maximum Cathode Current [•] .	3	4	3	ma
Writing Speed ^{††}	300000	300000	300000	in./sec
Number of Half-Tone Steps [□] .	5	5	5	
Viewing Duration	40	20	40	sec
Maximum Erasing-Uniformity				
Factor ^{□□}	0.5	0.5	0.5	
Stored-Spot Diameter ^{††} . . .	0.020	0.020	0.020	in.
Resolution [•]	50	50	50	lines/in.
Brightness ^{••}	175	1750	950	fl

** voltages are shown with respect to cathode of Viewing Gun.

Adjusted for brightest, most uniform pattern.

† Grid No.2 of the Viewing Gun is connected internally to grid No.4 of the Writing Gun.

• For conditions with combined adjustment of grid-No.1 voltage, grid-No.2 voltage, and grid-No.3 voltage to give brightest, most uniform pattern.

*, ††, □, ▲, □□, •, ••: See next page.



DISPLAY STORAGE TUBE

WRITING SECTION*

Range Values for Equipment Design:*

With any grid-No.2 voltage (E_{c2}) between 500 and 2750 volts

Grid-No.4 Voltage (E_{c4})	95% to 105% of E_{c2}	volts
Grid-No.3 Voltage for Focus	14% to 28% of E_{c2}	volts
Maximum Grid-No.1 Voltage for Cutoff of Undelected Focused Spot.	-4.6% of E_{c2}	volts
Maximum Grid-No.3 Current	-15 to +10	μ amp
Maximum Cathode Current	See Curve	
Deflection Factors:		
DJ ₁ and DJ ₂	28 to 38 v dc/in./kv of E_{c4}	
DJ ₃ and DJ ₄	28 to 38 v dc/in./kv of E_{c4}	
Focused Beam Position	##	

Examples of Use of Design Ranges:*

With grid-No.2 voltage of	1500	2500	volts
Grid-No.4 Voltage (E_{c4})	1425 to 1575	2375 to 2625	volts
Grid-No.3 Voltage for Focus	210 to 420	350 to 700	volts
Maximum Grid-No.1 Voltage for Cutoff of Undelected Focused Spot.	-69	-115	volts
Deflection Factors when $E_{c4} = E_{c2}$:			
DJ ₁ and DJ ₂	42 to 57	70 to 95	v dc/in.
DJ ₃ and DJ ₄	42 to 57	70 to 95	v dc/in.

Equivalent Values for Examples of Writing-Gun Voltages
Referred to Cathode of Viewing Gun:

Cathode Voltage	-1450 to -1395	-2450 to -2395	volts
Grid-No.2 Voltage	-25 to +180	-75 to +230	volts
Grid-No.3 Voltage for Focus	-1240 to -975	-2100 to -1695	volts
Grid-No.4 Voltage	50 to 105	50 to 105	volts

VIEWING SECTION and WRITING SECTION

Circuit Values:

Grid-No.1-Circuit Resistance (Either gun)	1.0 max.	megohm
Resistance in Any Deflecting-Electrode Circuit ^{††}	0.1 max.	megohm
Backing-Electrode-Circuit Resistance.	0.005 max.	megohm
Series Current-Limiting Resistance in Screen Circuit.	1.0 min.	megohm

* Voltages are shown with respect to cathode of Writing Gun.

†† Measured under conditions of writing from just zero brightness (viewing-beam cutoff) to maximum brightness with grid No.1 of Writing Gun at -10 volts with respect to cathode of Writing Gun, and grids No.2 and No.4 of Writing Gun at +2500 volts with respect to cathode of Writing Gun.

□ Observed with an RCA-2F21 Monoscope display.

▲, □, ●, ○, ●, ●, ##, ■: See next page.



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DISPLAY STORAGE TUBE

- ▲ Expressed in terms of the time required for the brightness of the un-written background to rise from just zero brightness (viewing-beam cutoff) to 10% of the maximum brightness.
- Defined as $(t_2 - t_1)/t_2$, where
 - t_1 = time measured from start of erasing to instant at which any screen area is reduced to zero brightness.
 - t_2 = time measured from start of erasing to instant at which entire screen area is reduced to zero brightness.
- ⊗ Measured by shrinking-raster method and with grids No.2 and No.4 of Writing Gun at +2500 volts with respect to cathode of Writing Gun.
- ⚡ Measured with entire storage grid written to produce maximum brightness and with screen at indicated voltage.
- The cathode of the Writing Gun is operated at about -2500 volts with respect to the cathode of the Viewing Gun which is usually operated at ground potential.
- ## The center of the undeflected focused beam will fall within a circle having a 10-mm radius concentric with the center of the face under the following conditions: grids No.2 and No.4 of Writing Gun at +2500 volts with respect to cathode of Writing Gun, grid No.3 of Writing Gun at voltage to give focus, grid No.1 of Writing Gun at voltage which will permit storage of a charge just sufficient to give a barely perceptible spot on screen, Viewing Section operating under normal conditions, and tube shielded against extraneous fields.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

OPERATING CONSIDERATIONS

Magnetic shielding must be provided to prevent external fields from interfering with the required accurate control of the low-velocity viewing beam. A cylindrical shield of properly annealed high-permeability material about .1/16-inch thick is usually satisfactory. The screen cable should be placed outside the shield.

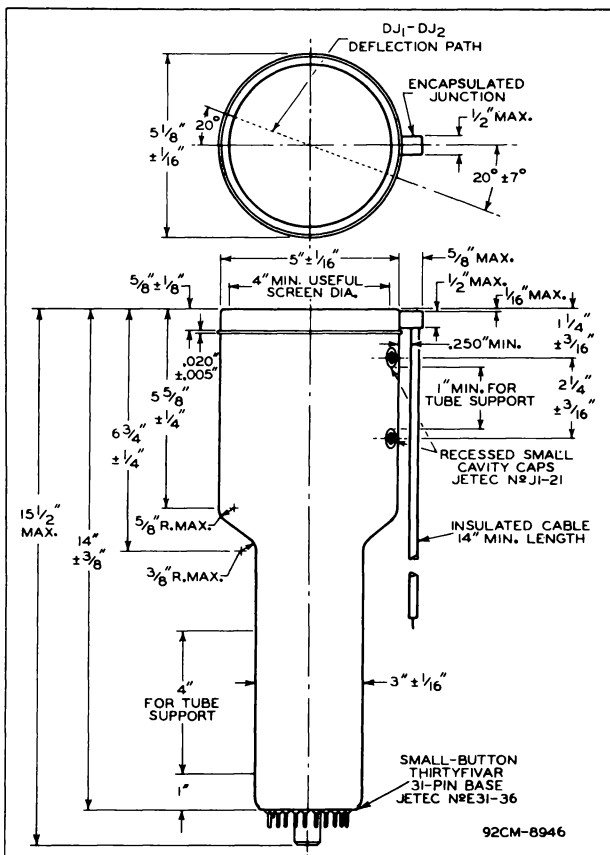
The *metal flange* at the face end of the tube requires the use of a spring-contact ring bearing against the edge of the flange.

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing beam on until the writing beam is turned off.



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DISPLAY STORAGE TUBE



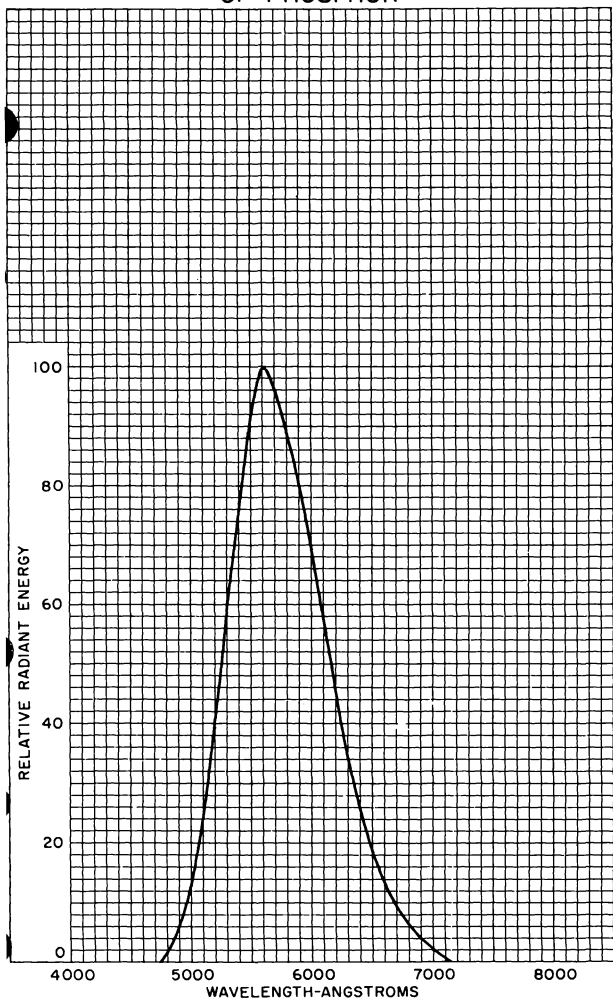
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 30° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF FACEPLATE. THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ₁ AND DJ₂ BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 27, $\pm 100^\circ$; EACH CAVITY CAP (ON SAME SIDE AS PIN 27), $\pm 170^\circ$; ENCAPSULATED JUNCTION, $\pm 100^\circ$. ANGLE BETWEEN DJ₁ - DJ₂ DEFLECTION PATH AND DJ₃ - DJ₄ DEFLECTION PATH IS $90^\circ \pm 30^\circ$.



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SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR



6866



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AVERAGE CHARACTERISTIC

VIEWING SECTION $E_f = 6.3$ VOLTS

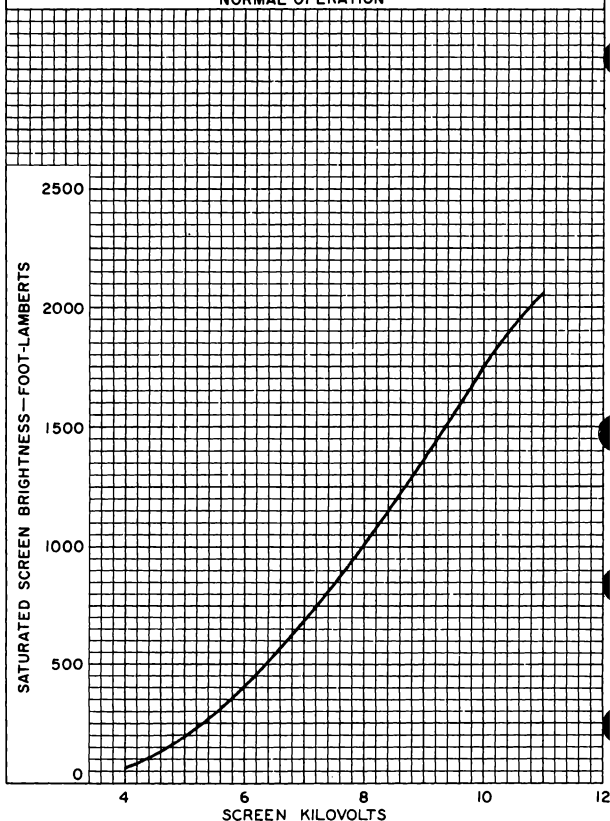
BACKING-ELECTRODE VOLTS* = 5

GRID-N₂ 4 VOLTS* = 210GRID-N₂ 2 VOLTS* = 85
 GRID-N₂ 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
 GRID-N₂ 1 VOLTS* } MOST UNIFORM DISPLAY

*REFERRED TO CATHODE OF VIEWING GUN

WRITING SECTION

NORMAL OPERATION



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9043



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AVERAGE CHARACTERISTICS

VIEWING SECTION $E_f = 6.3$ VOLTS

SCREEN KILOVOLTS* = 5 TO 10

BACKING-ELECTRODE VOLTS* = 5

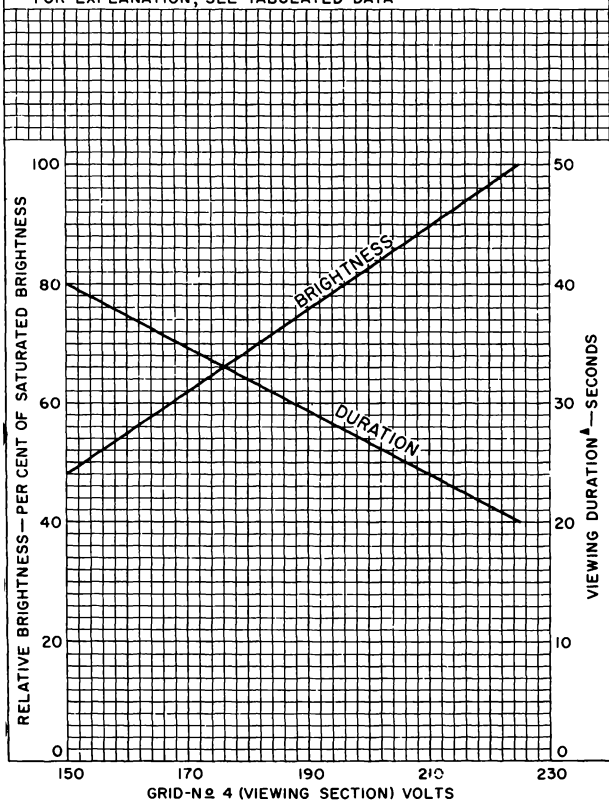
GRID-N₂ 2 VOLTS* = 85GRID-N₂ 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-N₂ 1 VOLTS* } MOST UNIFORM DISPLAY

* REFERRED TO CATHODE OF VIEWING GUN

WRITING SECTION

NORMAL OPERATION

▲ FOR EXPLANATION, SEE TABULATED DATA

GRID-N₂ 4 (VIEWING SECTION) VOLTS

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9044



TYPICAL ERASURE CHARACTERISTICS

VIEWING SECTION

 $E_f = 6.3$ VOLTSGRID-N₂ 4 VOLTS* = 210

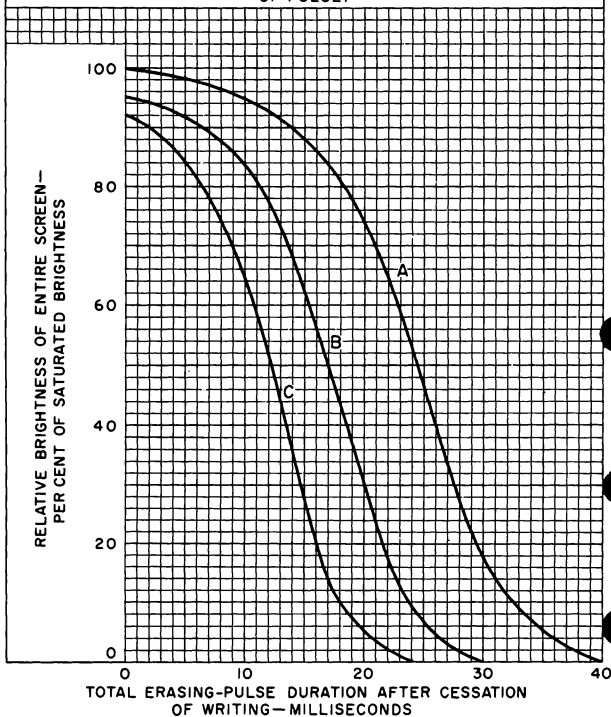
SCREEN KILOVOLTS* = 10

GRID-N₂ 2 VOLTS* = 85
 GRID-N₂ 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
 GRID-N₂ 1 VOLTS* } MOST UNIFORM DISPLAY

*REFERRED TO CATHODE OF VIEWING GUN

CURVE	BACKING-ELECTRODE VOLTS	
	DC	POSITIVE RECTANGULAR PULSE AMPLITUDE (APPROX.)
A	10	10
B	5	8
C	2	7

ERASURE IS PRODUCED BY POSITIVE RECTANGULAR PULSE APPLIED TO BACKING-ELECTRODE. INDICATED DURATION IS SUM OF DURATIONS OF NUMBER OF PULSES OR ELAPSED TIME AFTER START OF PULSE.





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CURRENT CHARACTERISTIC FOR WRITING GUN

WRITING SECTION

 $E_f = 6.3$ VOLTS

GRID-NO 4 VOLTS* = GRID-NO. 2 VOLTS

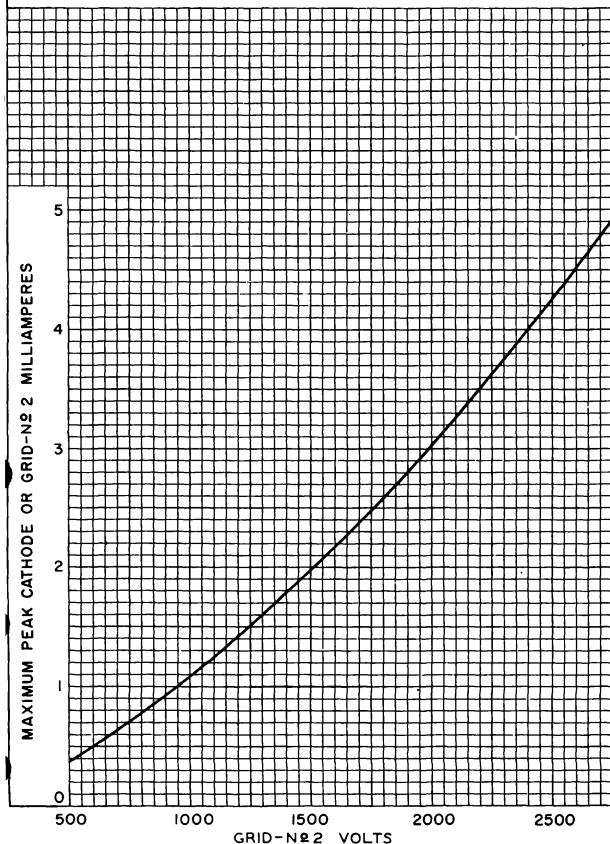
GRID-NO 3 VOLTS* = ADJUSTED FOR FOCUS

GRID-NO 1 VOLTS* = 0

*REFERRED TO CATHODE OF WRITING GUN

VIEWING SECTION

NORMAL OPERATION



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9046

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TYPICAL DRIVE CHARACTERISTIC FOR WRITING GUN

WRITING SECTION

$E_f = 6.3$ VOLTS

GRID-№ 4 VOLTS* = 2500

GRID-№ 3 VOLTS* = ADJUSTED FOR FOCUS

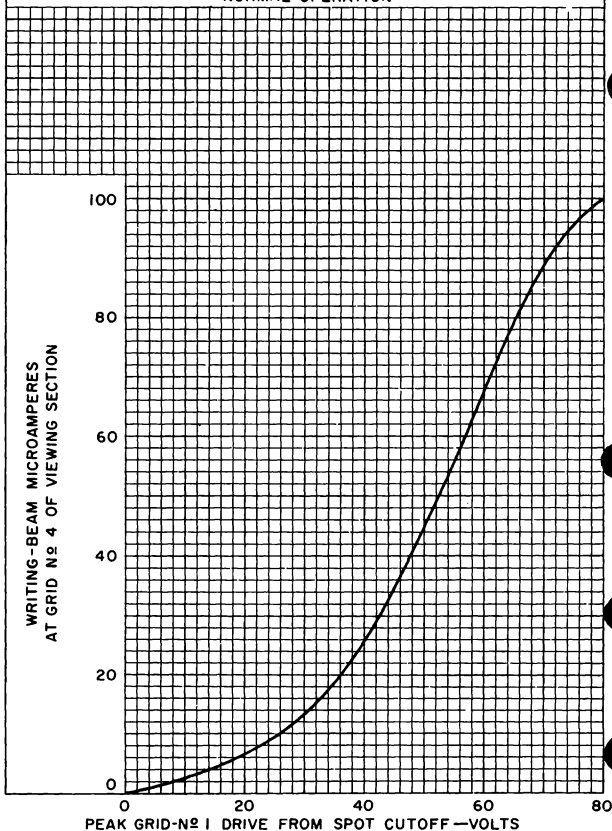
GRID-№ 2 VOLTS* = 2500

GRID-№ 1* BIASED TO SPOT CUTOFF

*REFERRED TO CATHODE OF WRITING GUN

VIEWING SECTION

NORMAL OPERATION



TUBE DIVISION

92CM-9048

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

**RCA TUBE
HANDBOOK
HB-3**

**PHOTOTUBE
SECTION**



This section contains data on RCA phototubes having a variety of spectral responses, shapes, and sizes. It includes both gas and vacuum single-unit types as well as multiplier types for diversified applications.

*For further Technical Information, write to
Commercial Engineering, Tube Department,
Radio Corporation of America, Harrison, N. J.*



PRICES[□] OF PHOTOTUBE TYPES

Type	Schedule D [•]	Schedule U [▲]
1P21.....	-	\$ 50.00
1P22.....	-	14.75
1P28.....	-	15.50
1P29.....	-	2.95
1P37.....	-	2.85
1P39.....	-	1.75
1P40.....	-	1.90
1P41.....	-	2.80
1P42.....	-	5.70
868.....	-	2.50
917.....	-	3.50
918.....	-	3.10
919.....	-	3.50
920.....	-	4.15
921.....	\$ 2.05	-
922.....	-	1.95
923 4	-	2.05
924 4	-	3.30
925.....	-	2.40
926.....	-	2.90
927.....	2.50	-
928.....	-	2.85
929.....	-	1.50
930.....	-	1.65
931-A.....	-	8.60
934.....	-	3.40
935.....	-	7.80
5581.....	-	2.25
5582.....	-	2.65
5583.....	-	3.05
5584.....	-	3.95
5652.....	-	6.55
5819.....	-	55.00
6199.....	-	55.00
6217.....	-	70.00

□ This price list applies only in the United States of America and is subject to change without notice. All prices are exclusive of all Federal, State and local excise, sales, and similar taxes.

▲ Schedule U shows user prices for tube types priced for distribution through other than dealer and service channels.

• Schedule D shows list prices for tube types priced for distribution through dealer and service channels.

* Not recommended for new equipment design.

INFORMATION ON PURCHASING ABOVE TYPES

Information as to where RCA Phototube types can be purchased may be obtained from our regional office nearest you or from Tube Department, Radio Corporation of America, Harrison, N.J.

JUNE 1, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

PHOTOTUBE
PRICES



PHOTOTUBE CLASSIFICATION CHART

When choosing tube types, the equipment designer should refer to the RCA PREFERRED TYPES LIST and its companion list - TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN - both of which appear in the General Section.

Response	S-1	S-3	S-4	S-5	S-8	S-9	S-10	S-11
SINGLE-UNIT PHOTOTUBES								
Vacuum Types	917 919 922 [□] 925 6570 [†]	926 [□]	1P39 929 934 5653	935		1P42 [●]		
Gas Types	1P40 1P41 [●] 868 918 921 [□] 923 924 [●] 927 928 [*] 930 6405/ 1640 [†]	1P29	1P37 5581 5582 [□] 5583					
TWIN PHOTOTUBES								
Vacuum Types			5652					
Gas Types	920		5584					
MULTIPLIER PHOTOTUBES								
Vacuum Types			1P21 [▲] 931-A [▲] 6323 [§] [▲] 6328 [§] [▲] 6472 [§] [▲]	1P28 [▲]	1P22 [▲]		6217 ^{●■}	5819 ^{●■} 6199 ^{●■} 6342 ^{●■} 6372 [■] 6655 ^{●■} 6810 ^{●■}
PHOTOCONDUCTIVE CELLS See Semiconductor Device Section								
[□] Cartridge type. [†] Low-microphonic type. [●] Head-on type. [*] Non-directional type. [§] For headlight-control service. [▲] 9-stage type. [■] 10-stage type. [●] 14-stage type.								



DEFINITIONS OF PHOTOTUBE TERMS

Radiant Sensitivity. The quotient of output current by incident radiant power of a given wavelength, at constant electrode voltages.

Cathode Radiant Sensitivity. The quotient of current leaving the photocathode by incident radiant power of a given wavelength.

Luminous Sensitivity. The quotient of output current by incident luminous flux, at constant electrode voltages.

Cathode Luminous Sensitivity. The quotient of current leaving the photocathode by the incident luminous flux.

Current Amplification. Ratio of the output current to the photocathode current, at constant electrode voltages.

Equivalent Anode-Dark-Current Input. The quotient of the anode dark current by the luminous sensitivity.

Equivalent Noise Input. That value of incident luminous flux which when modulated in a stated manner produces an rms output current equal to the rms noise current within a specified bandwidth.

Electrode Dark Current. The electrode current which flows when there is no radiant flux incident on the photocathode.

Median. That value in a series such that half of the tubes in the series are on one side of it, and half on the other.



PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS

GENERAL CONSIDERATIONS

The range of luminous-sensitivity limits given for a phototube on the data sheets of this Section is that which the tube will display when operated under low-current conditions.

If the tube is to be operated under conditions approaching its maximum-current rating, the equipment design should provide for a wider sensitivity range having a minimum value equal to one-half of that shown for low-current operation. The sensitivity of a phototube under such high-current conditions is dependent upon the tube type; as follows:

1. Single-Unit and Twin Phototubes

- a. **Gas Types:** For high-current operation, and particularly in applications in which the type is subjected to these higher values continuously, a drop in sensitivity below the values for low-current operation may be expected, the extent of the drop being affected by the severity of the operating conditions. After a period of idleness, a gas phototube usually recovers most of its initial sensitivity.
- b. **Vacuum Types:** Unlike gas phototubes, this class of phototubes shows negligible drop in sensitivity values for different degrees of illumination and over long periods of use. The output current of a vacuum phototube is a linear function of the exciting illumination under normal operating conditions. The frequency response is flat up to frequencies at which transit-time effects become the limiting factor.

2. Multiplier Phototubes

Although RCA Multiplier Phototubes are vacuum types, a drop in sensitivity is to be expected from this class of phototubes when operated at high anode-current values. The extent of the drop is affected by the nature and severity of the operating conditions to which the tube is subjected. After a period of idleness, the multiplier phototube usually recovers a substantial percentage of this loss of sensitivity.

Multiplier-phototube-sensitivity values are dependent on the respective amplification of each dynode stage. Hence, large variations in sensitivity can be expected between individual tubes of a given type. The overall amplification of a multiplier phototube is equal to the average amplification per stage raised to the n th power, where n is the number of stages. Thus, very small variations in amplification per stage produce very large changes in overall tube amplification.

Because these overall changes are very large, it is advisable for designers to provide adequate adjustment of the supply voltage per stage so as to be able to adjust the amplification of individual tubes to the desired design value. It is suggested that an overall voltage-adjustment

(continued on next page)



PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS

range of at least 2 to 1 be provided. When the output current can be controlled by change in the illumination of the photocathode of the multiplier phototube, the required range of adjustment in the voltage per stage can be reduced.

SENSITIVITY MEASUREMENTS

The luminous-sensitivity values shown on the data pages of this Section are measured according to the following procedures:

1. Single-Unit and Twin Phototubes

- a. **Gas Types:** The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. For the 0-cycle measurements, a light input of 0.1 lumen is used, unless otherwise specified. For the 5000- and 10000 cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean. For all measurements, a dc anode-supply voltage of 90 volts and a 1.0-megohm load resistor are employed. Under these conditions, the effect of tube capacitance is negligible.
- b. **Vacuum Types:** The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. A steady light input of 0.1 lumen is used, unless otherwise specified, together with a dc anode-supply voltage of 250 volts and a 1-megohm load resistor.

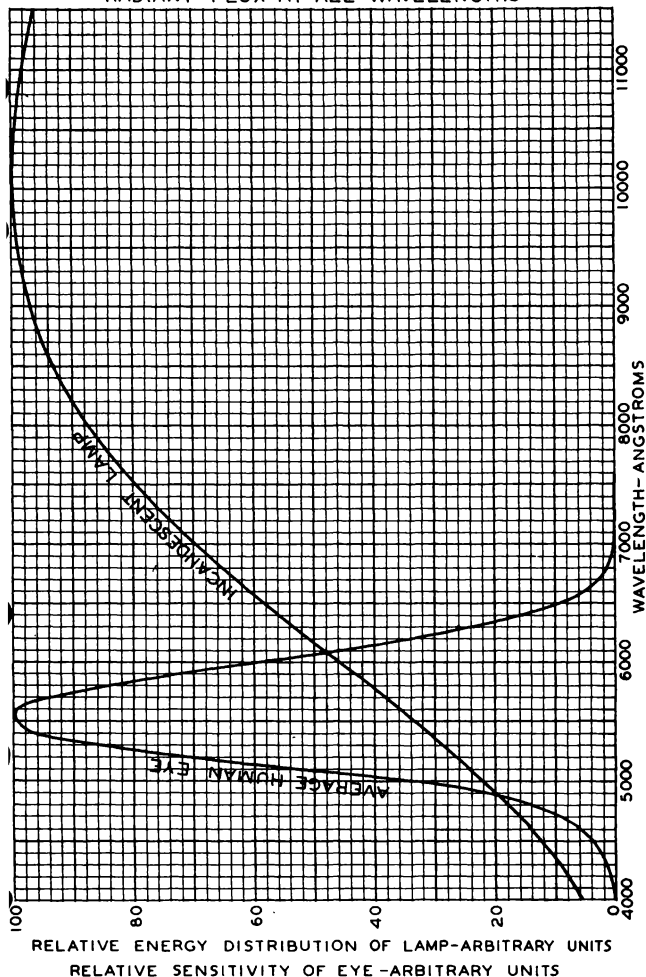
2. Multiplier Phototubes

The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. A light flux of 10 microlumens from a rectangular aperture approximately 0.8" long and 0.2" wide is projected normal to the cathode in the direction noted on the basing diagram and outline. The load resistor has a value of 0.01 megohm. The applied voltages are specified on the individual data sheets.



SPECTRAL CHARACTERISTIC OF HUMAN EYE & OF TUNGSTEN LAMP AT COLOR TEMPERATURE OF 2870 °K

EYE CURVE IS ON BASIS OF EQUAL VALUES OF
RADIANT FLUX AT ALL WAVELENGTHS



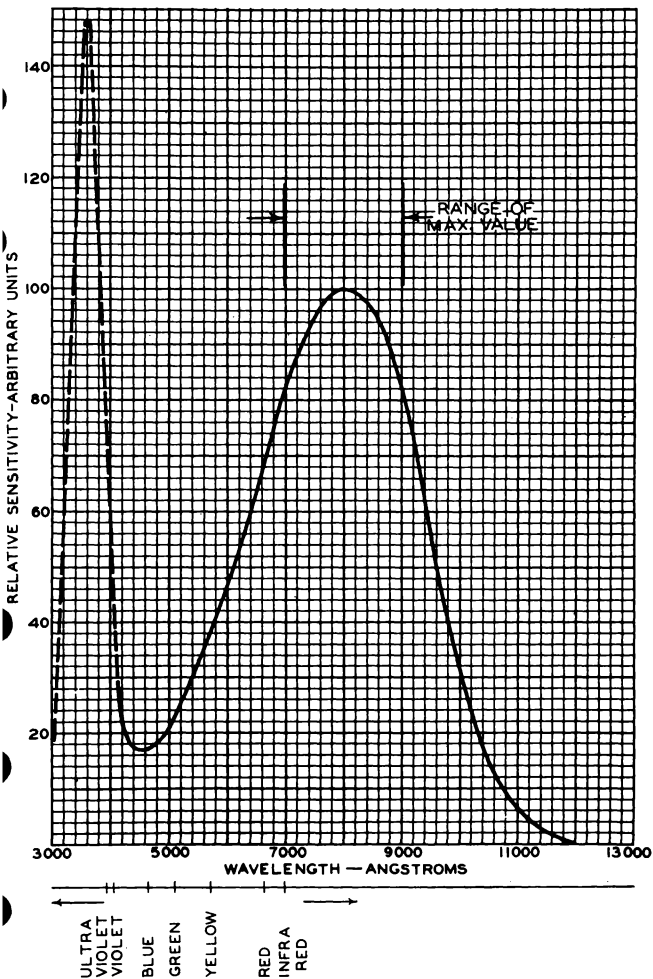
OCT. 20, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6435RI



**SPECTRAL SENSITIVITY CHARACTERISTIC
OF PHOTOTUBE HAVING
S-1 RESPONSE**
FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



MAR. 18, 1946

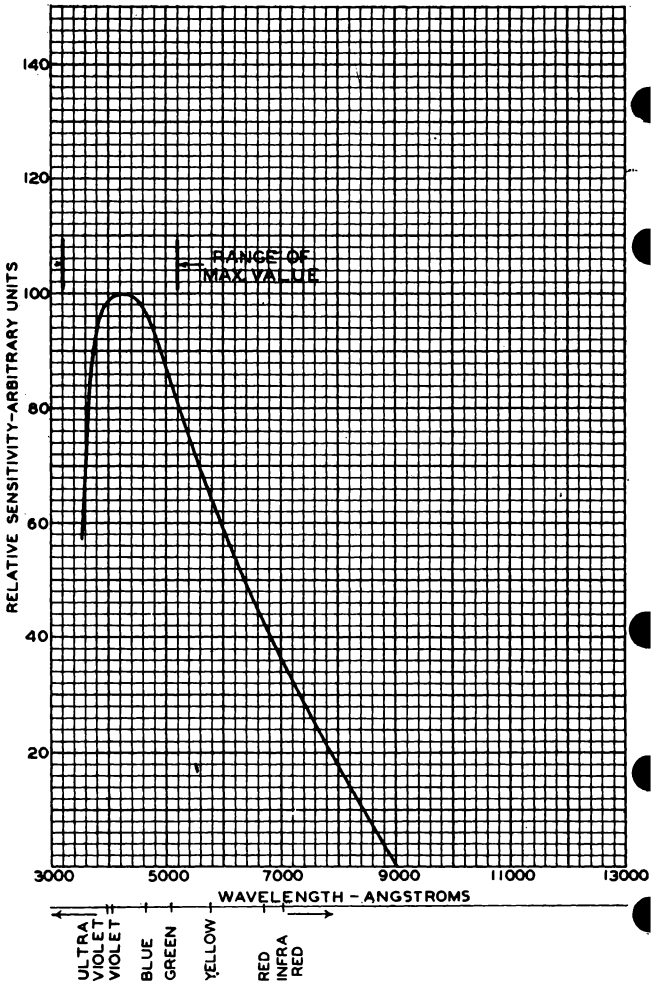
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6056R5



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-3 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



MAR. 21, 1946

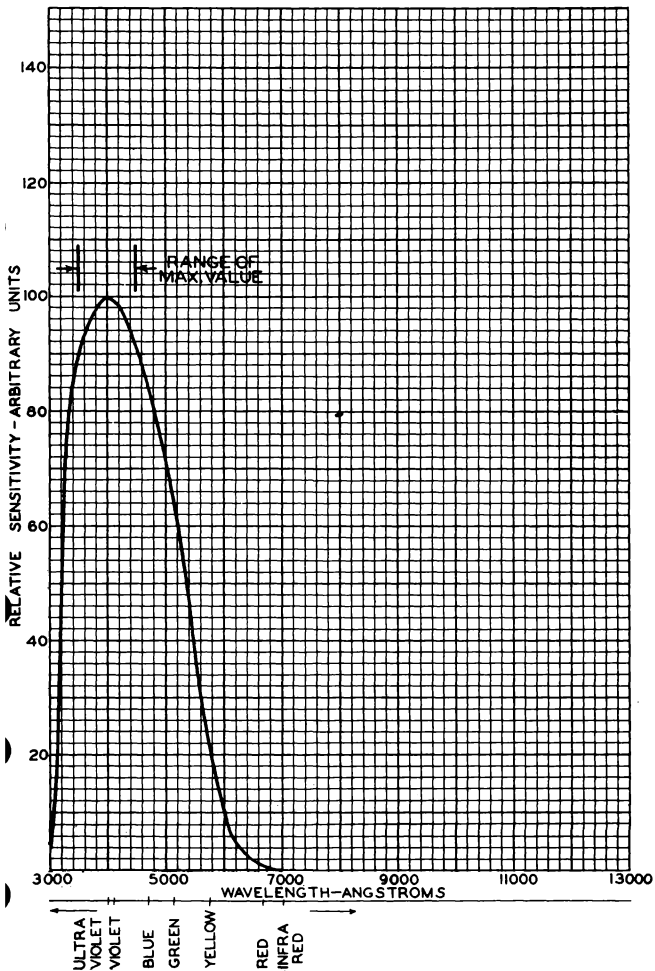
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6057R6



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-4 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



AUG. 12, 1947

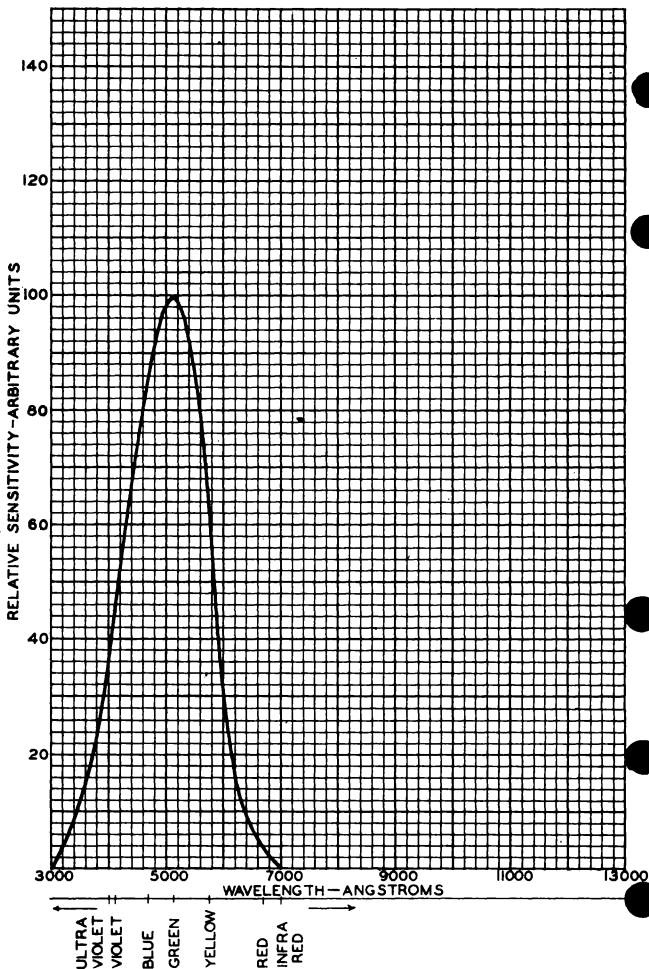
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 6152R7



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-4 RESPONSE

RADIANT FLUX FROM TUNGSTEN SOURCE AT 2870°K



MAR. 25, 1947

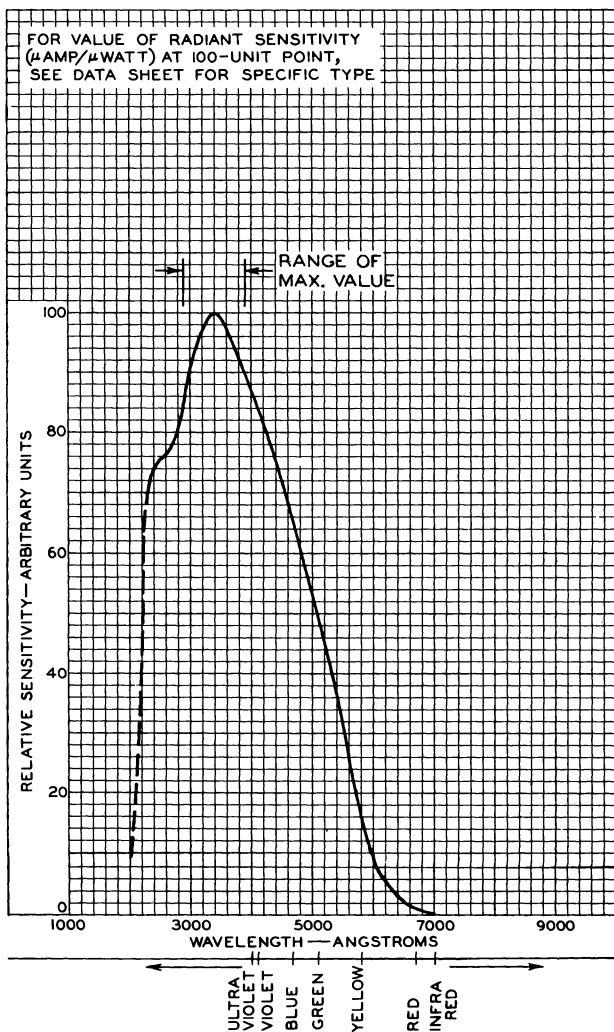
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6652R2



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-5 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



TUBE DIVISION

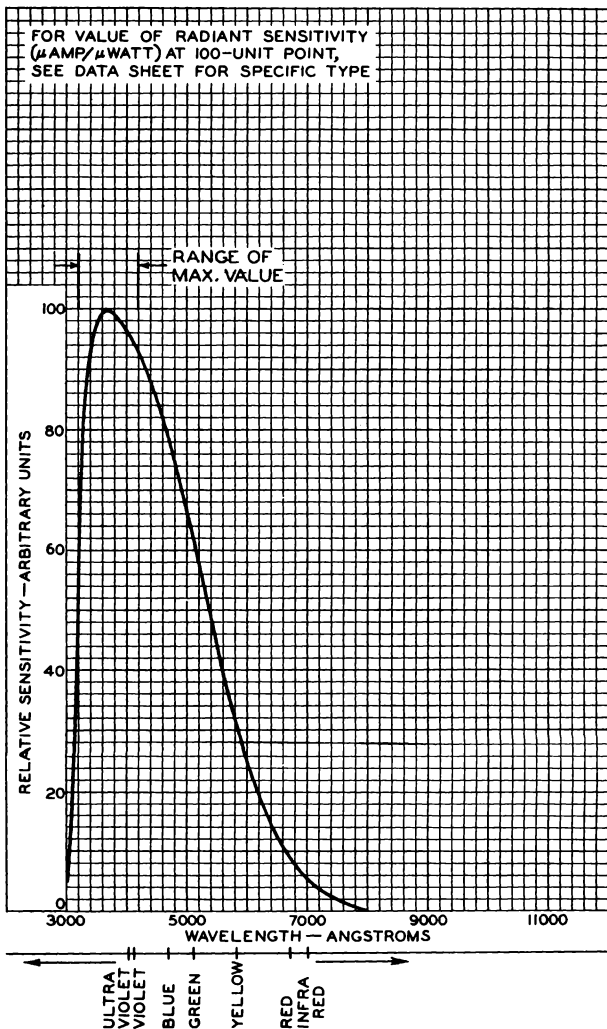
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6814R1



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-8 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



TUBE DIVISION

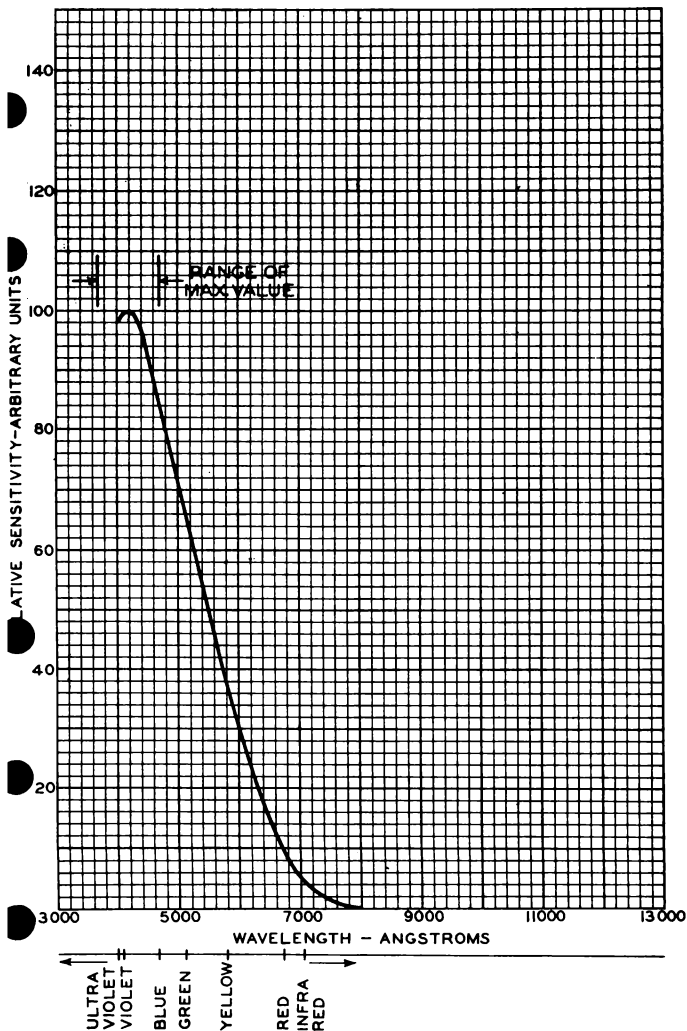
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6592R2



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-8 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



JULY 19, 1945

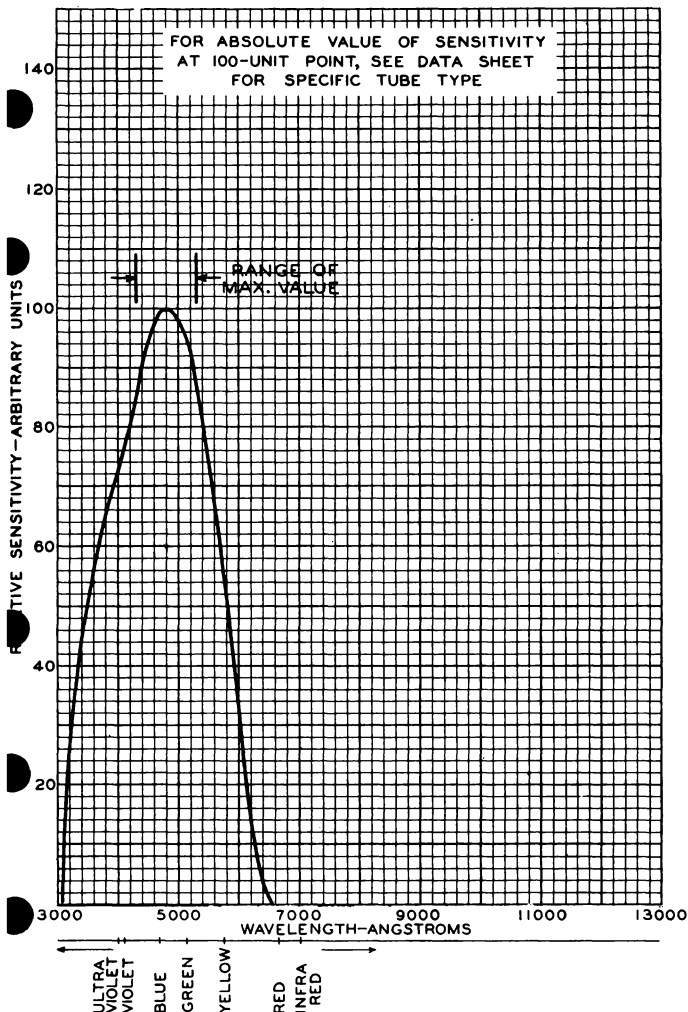
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6592R1



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-9 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



NOV. 11 1952

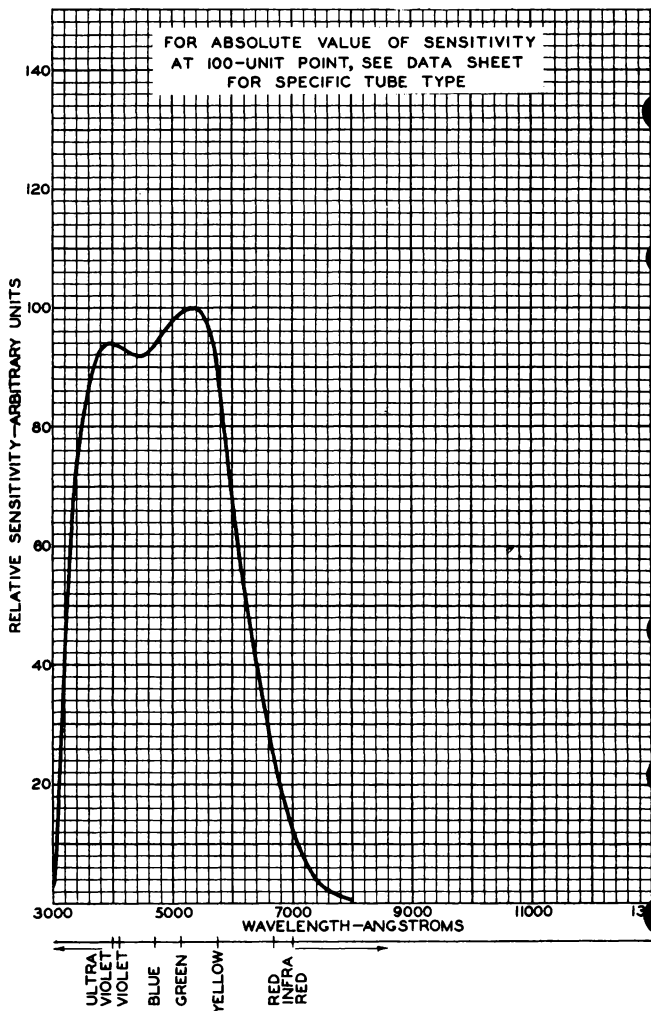
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7274R1



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-10 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



NOV. 11, 1952

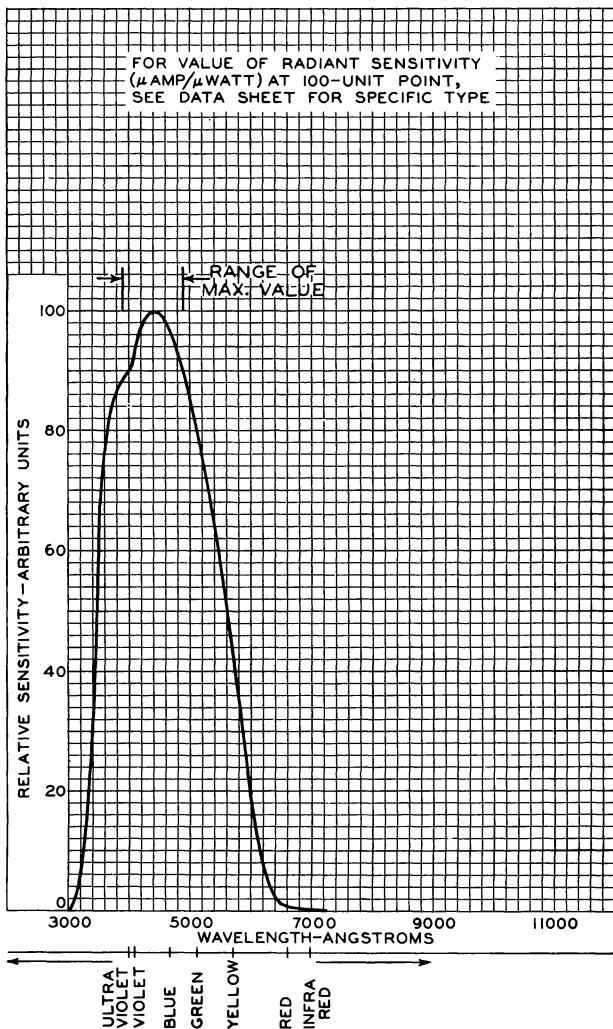
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-782IRI



SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-II RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



JULY 1, 1955

TUBE DIVISION

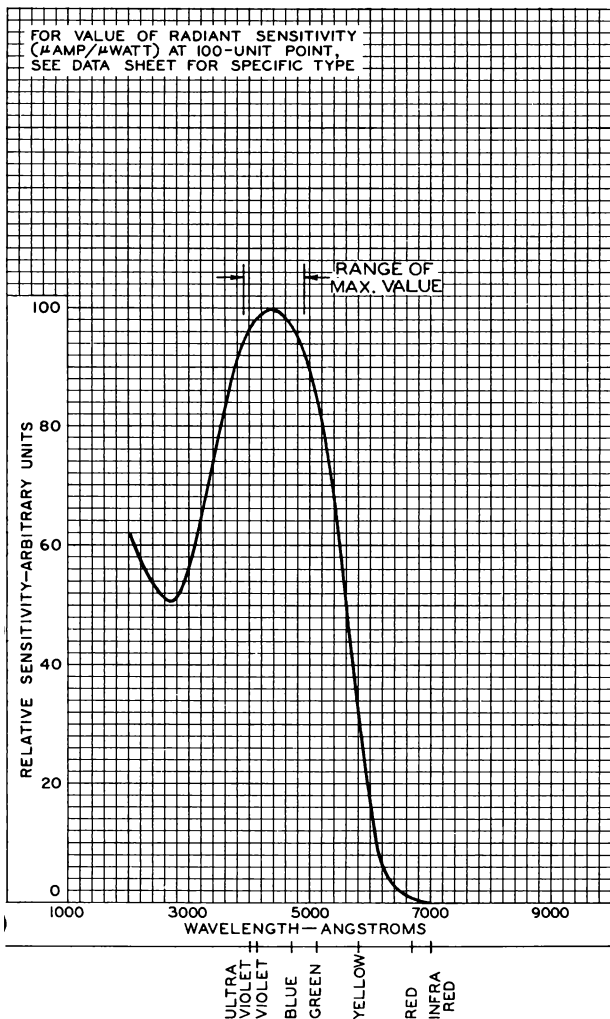
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-860IRI



TENTATIVE SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-13 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



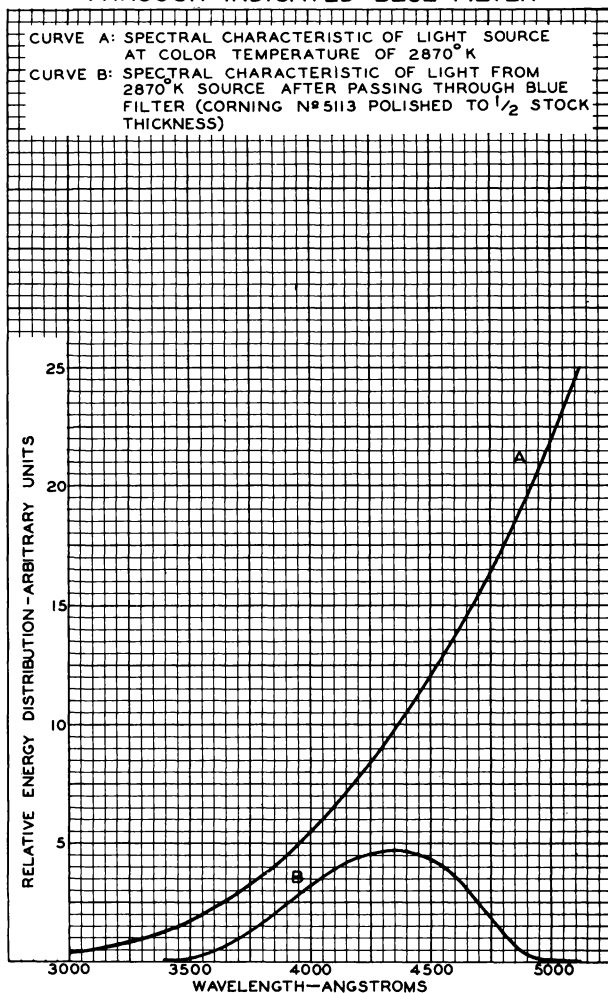
TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9037

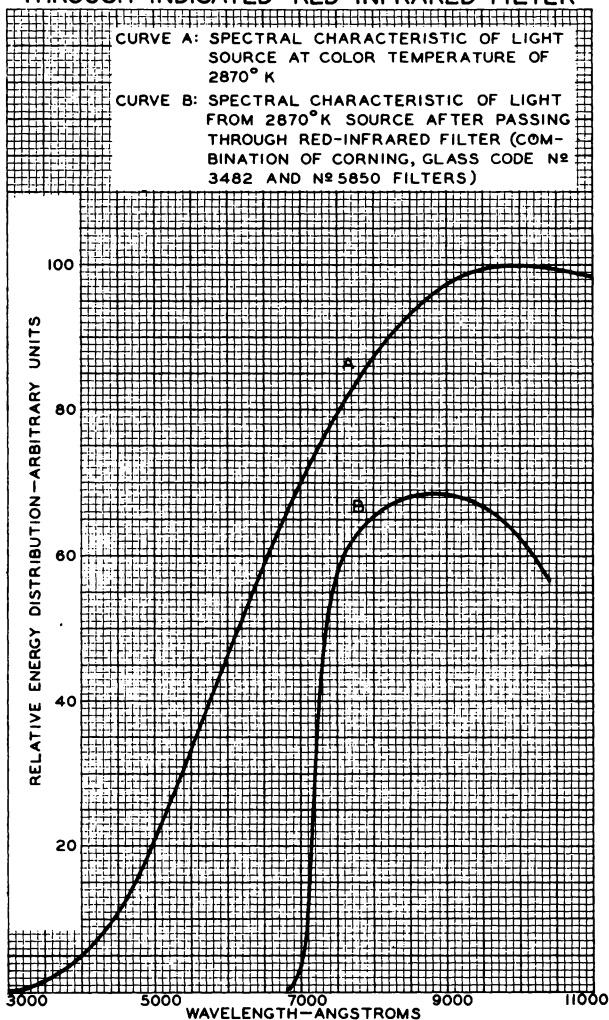


SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER



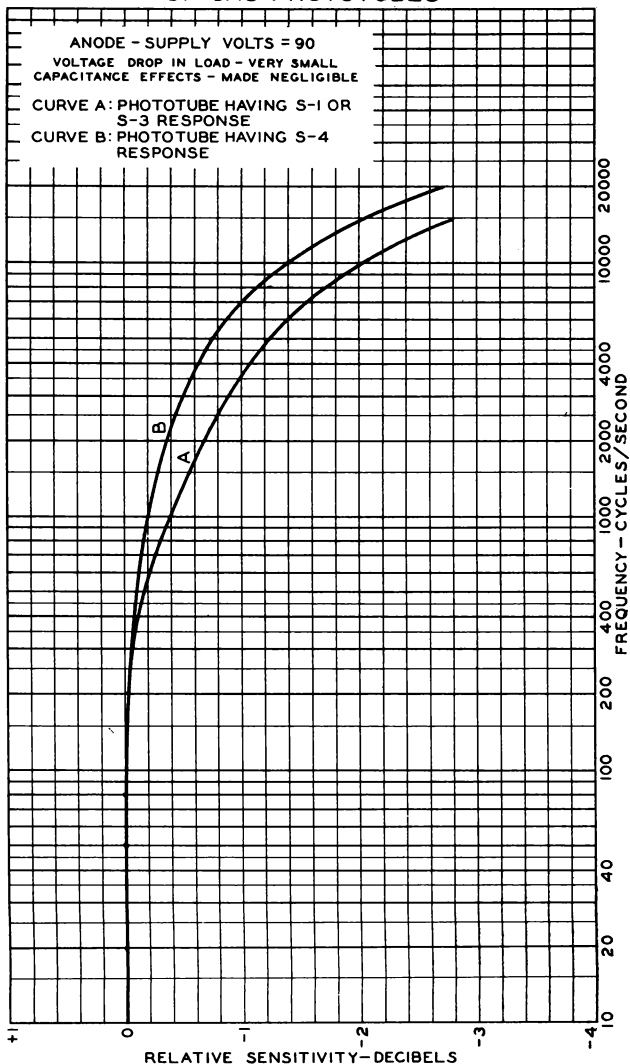


SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED RED-INFRARED FILTER





FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES



APRIL 30, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6864



IP21

IP21

MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE

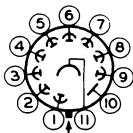
For applications involving very low light levels

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 $\pm$ 500 angstroms
Cathode:	
Minimum Projected Length*	15/16"
Minimum Projected Width*	5/16"
Direct Interelectrode Capacitances:	
Anode to Dynode No.9	4 μ f
Anode to All Other Electrodes	6.5 μ f
Maximum Overall Length	3-11/16"
Maximum Seated Length	3-1/8"
Seated Length to Center of Cathode	1-15/16" $\pm$ 3/32"
Maximum Diameter	1-5/16"
Bulb	T-9
Mounting Position	Any
Base	Small-Shell Submagnal 11-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	11K

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6



DIRECTION OF LIGHT

Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9
Pin 10 - Anode
Pin 11 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) ^a . .	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.9 and ANODE (DC or Peak AC) . .	250 max.	volts
PEAK ANODE CURRENT	1 max.	ma
AVERAGE ANODE CURRENT ^b	0.1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

With 100 volts per dynode stage and
100 volts between dynode No.9 and anode*

	Min.	Au.	Max.	
Anode Dark Current#	—	—	0.1	μ amp
Sensitivity:				
At 4000 Angstroms	—	74000	—	μ amp/ μ watt
Luminous ^a	40	80	—	amp/lumen
Current Amplification ^b	—	2000000	—	
Equivalent Noise Input ^a	—	5 $\times$ 10 ⁻¹³	—	lumen

♦ For the more usual applications, the 931-A is recommended.

* The use of about 50 volts between dynode No.9 and anode will give improved operating stability without sacrifice in sensitivity as explained in note under Type 931-A.

* on plane perpendicular to indicated direction of incident light.

□, ○, #, ●, ▲, ■, ★: See next page.

← Indicates a change.

NOV. 15, 1949

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IP21



IP21

MULTIPLIER PHOTOTUBE

→ Characteristics:

*With 75 volts per dynode stage
and 50 volts between dynode No. 9 and anode*

Sensitivity:	<u>Av.</u>	
At 4000 Angstroms.	11000	$\mu\text{amp}/\mu\text{watt}$
Luminous [▲]	12	amp/lumen
Current Amplification [■]	300000	

□ Referred to cathode.

○ Averaged over any interval of 30 seconds maximum.

* Dark current due to thermionic emission and ion feedback may be reduced by the use of refrigerants.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and MEASUREMENTS" at the front of this Section.

■ Ratio of anode sensitivity to cathode sensitivity.

* Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: 100 volts per stage, 25°C tube temperature, bandwidth of 1 cycle per second, tungsten light source at 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OUTLINE DIMENSIONS for Type 1P21
are the same as those for Type 931-A

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section

→ Indicates a change.

NOV. 15, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

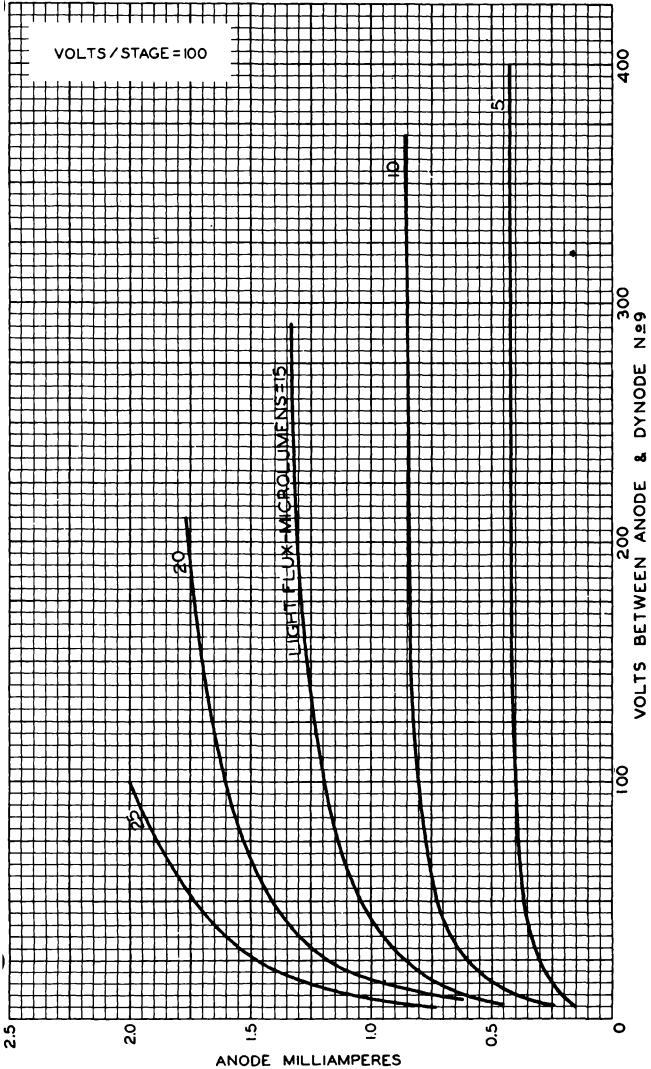
DATA



IP21

IP21

AVERAGE ANODE CHARACTERISTICS



OCT. 26, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

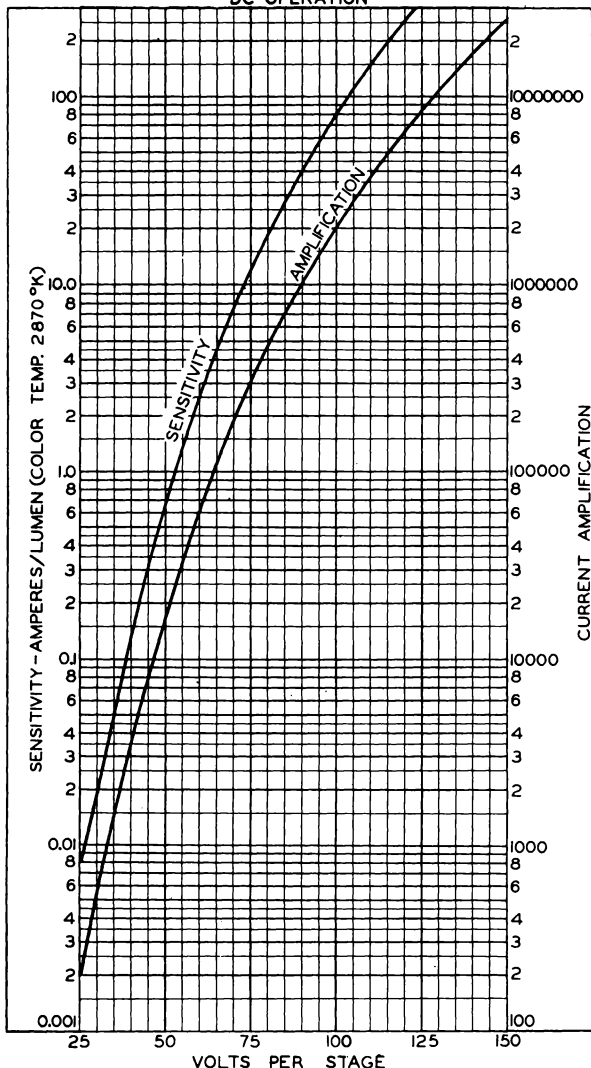
92CM-6456R3

IP21



IP21

AVERAGE CHARACTERISTICS DC OPERATION



OCT. 26, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

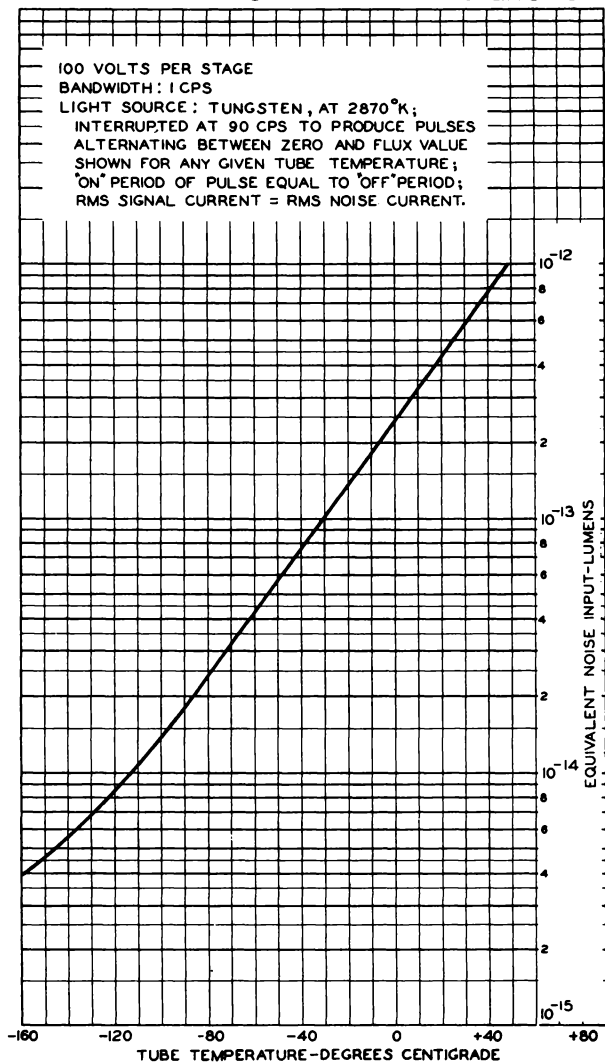
92CL - 6454R2



IP21

IP21

EQUIVALENT-NOISE-INPUT CHARACTERISTIC



OCT. 27, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7018R1



IP22

IP22

MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-8 RESPONSE

DATA

General:

Spectral Response S-8

Wavelength of Maximum Response 4200 $\pm$ 500 angstroms $\leftarrow$

Cathode:

Minimum Projected Length* 15/16"

Minimum Projected Width* 5/16"

Direct Interelectrode Capacitances:

Anode to Dynode No. 9 4 μf Anode to All Other Electrodes 6.5 μf

Maximum Overall Length 3-11/16"

Maximum Seated Length 3-1/8"

Seated Length to Center of Cathode 1-15/16" $\pm$ 3/32"

Maximum Diameter 1-5/16"

Bulb T-9

Mounting Position Any

Base Small-Shell Submagal 11-Pin, Non-Hygroscopic

Basing Designation for BOTTOM VIEW 11K

Pin 1- Dynode No.1

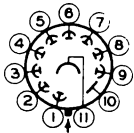
Pin 2- Dynode No.2

Pin 3- Dynode No.3

Pin 4- Dynode No.4

Pin 5- Dynode No.5

Pin 6- Dynode No.6



Pin 7- Dynode No.7

Pin 8- Dynode No.8

Pin 9- Dynode No.9

Pin 10- Anode

Pin 11- Cathode

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)[□] . . . 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.9

and ANODE (DC or peak AC) . . . 250 max. volts $\leftarrow$ PEAK ANODE CURRENT 10 max. ma $\leftarrow$ AVERAGE ANODE CURRENT[○] 1 max. ma $\leftarrow$ AMBIENT TEMPERATURE 50 max. °C $\leftarrow$

Characteristics:

With 100 volts per dynode stage and
100 volts between dynode No.9 and anode[⊙]

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>
Anode Dark Current [⊙]	-	-	0.25 μamp

Sensitivity:

At 4200 Angstroms 370 $\mu\text{amp}/\mu\text{watt}$ Luminous[⊙] 0.115 50 amp/lumenCurrent Amplification[⊙] 200000Luminous Detectivity[⊙] 1×10^{-10} lumen

[⊙] The use of about 50 volts between dynode No.9 and anode will give improved operating stability without sacrifice in sensitivity as explained in note under Type 931-A.

* On plane perpendicular to indicated direction of incident light.

□ Referred to cathode.

○, ⊙, ⊙, ⊙, ⊙: See next page.

$\leftarrow$ Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IP22



IP22

MULTIPLIER PHOTOTUBE

→ Characteristics:

*With 75 volts per dynode stage
and 50 volts between dynode No. 9 and anode*

Sensitivity:	<i>Av.</i>
At 4200 Angstroms.	55 $\mu\text{amp}/\mu\text{watt}$
Luminous ^Δ	0.09 amp/lumen
Current Amplification [■]	30000

° Averaged over any interval of 30 seconds maximum.

† Dark current due to thermionic emission and ion feedback may be reduced by the use of refrigerants.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at the front of this Section.

■ Ratio of anode sensitivity to cathode sensitivity.

★ Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: 100 volts per stage, 25°C tube temperature, bandwidth of 1 cycle per second, tungsten light source at 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OUTLINE DIMENSIONS for Type IP22
are the same as those for Type 931-A

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-8 Response
is shown at the front of this Section

→ Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT

DATA

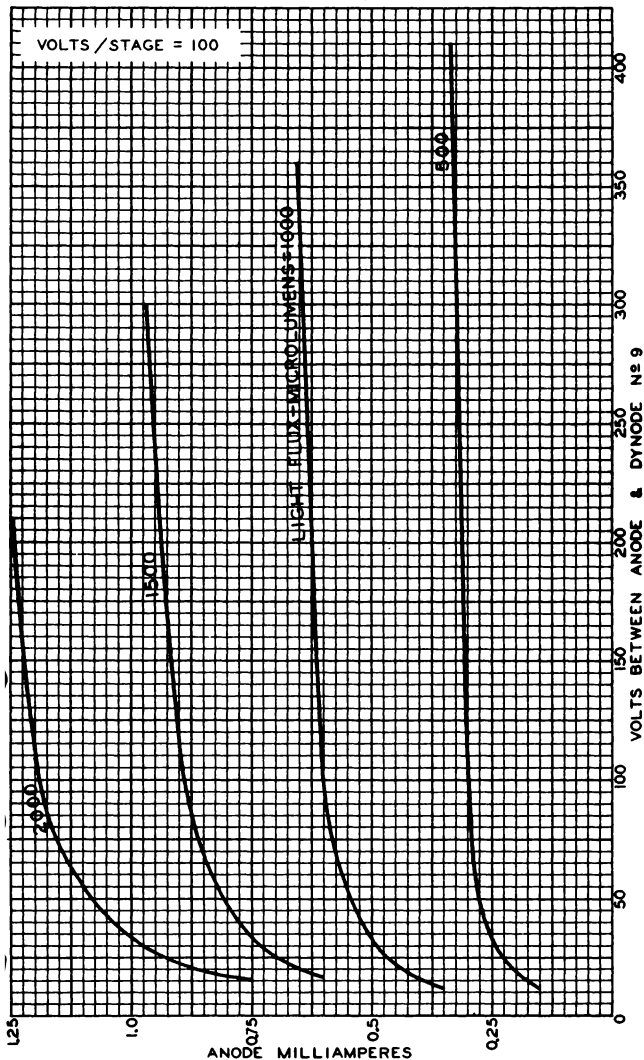
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



IP22

IP22

AVERAGE ANODE CHARACTERISTICS



MAR.12, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

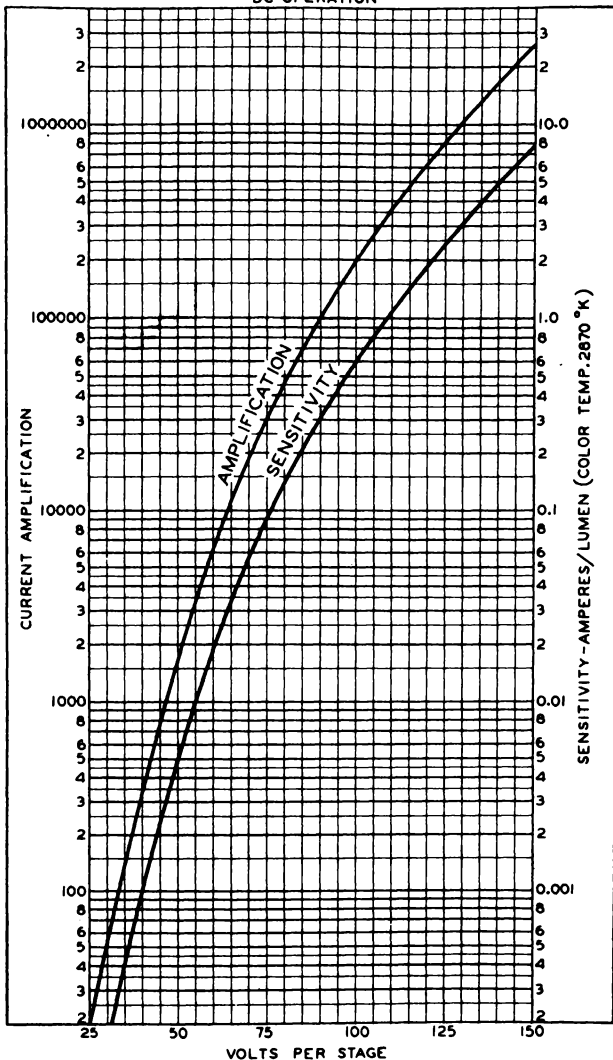
92CM-6585R1

IP22



IP22

AVERAGE CHARACTERISTIC DC OPERATION



JUNE 15, 1945

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6586



IP28

MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-5 RESPONSE

IP28

DATA

General:

Spectral Response S-5
 Wavelength of Maximum Response. 3400 ± 500 angstroms
 Cathode:

Minimum projected length* $15/16"$

Minimum projected width* $5/16"$

Direct Interelectrode Capacitances (Approx.):

Anode to dynode No.9 $4.4 \mu\text{f}$

Anode to all other dynodes. $6 \mu\text{f}$

Maximum Overall Length $3-11/16"$

Maximum Seated Length $3-1/8"$

Length from Base Seat to Center of

Useful Cathode Area $1-5/16" \pm 3/32"$

Maximum Diameter $1-5/16"$

Mounting Position Any

Weight (Approx.). 1.2 oz

Bulb T-9

Base. Small-Shell Subminiature 11-Pin (JETEC No. B11-88),

Non-hygroscopic

Basing Designation for BOTTOM VIEW. 11K

Pin 1 - Dynode No.1

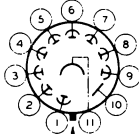
Pin 2 - Dynode No.2

Pin 3 - Dynode No.3

Pin 4 - Dynode No.4

Pin 5 - Dynode No.5

Pin 6 - Dynode No.6



DIRECTION OF INCIDENT
RADIATION

Pin 7 - Dynode No.7

Pin 8 - Dynode No.8

Pin 9 - Dynode No.9

Pin 10 - Anode

Pin 11 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.9

AND ANODE (DC or Peak AC) 250 max. volts

AVERAGE ANODE CURRENT* 0.5 max. ma

AMBIENT TEMPERATURE 75 max. °C

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No.1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No.9 and anode

With E = 1000 volts (except as noted)

Min. Median Max.

Sensitivity:

Radiant, at 3400

angstroms - 61800 - $\mu\text{amp}/\mu\text{watt}$

* On plane perpendicular to the indicated direction of incident radiation.

• Averaged over any interval of 30 seconds maximum.

← Indicates a change.

IP28



IP28

MULTIPLIER PHOTOTUBE

	Min.	Median	Max.	
Cathode radiant, at 3400 angstroms . .	-	0.050	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: $\bullet$				
At 0 cps	10	50	300	amp/lumen
At 100 Mc	-	47.5	-	amp/lumen
Cathode luminous $\blacktriangle$. .	-	40	-	$\mu\text{amp}/\text{lumen}$
Current Amplification.	-	1,250,000	-	
Equivalent Anode-Dark- Current Input $\blacksquare$. .	-	-	1.25×10^{-9}	lumen
Equivalent Noise Input:				
Luminous $\star$	-	7.5×10^{-13}	-	lumen
Ultraviolet $\dagger$	-	8×10^{-16}	-	watt

With $E = 750$ volts (except as noted)

	Min.	Median	Max.	
Sensitivity:				
Radiant at 3400 angstroms.	-	7900	-	$\mu\text{amp}/\mu\text{watt}$
Cathode radiant, at 3400 angstroms . .	-	0.050	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: $\bullet$				
At 0 cps	-	6.4	-	amp/lumen
Cathode luminous $\blacktriangle$. .	-	40	-	$\mu\text{amp}/\text{lumen}$
Current Amplification.	-	160000	-	

$\bullet$ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

$\blacktriangle$ For conditions the same as shown under ($\bullet$) except that the value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected together as anode.

$\star$ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

$\blacksquare$ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

$\star$ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier band-width of 1 cycle per second, tungsten light source at color temperature of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

$\dagger$ Determined under the same conditions as shown under ($\star$) except that use is made of a monochromatic source having radiation at 2537 angstroms.

Curves showing
VARIATION IN SENSITIVITY OF PHOTOCATHODE for Type 1P28
are the same as those shown for Type 931-A

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-5 Response
is shown at the front of this Section



IP28

IP28

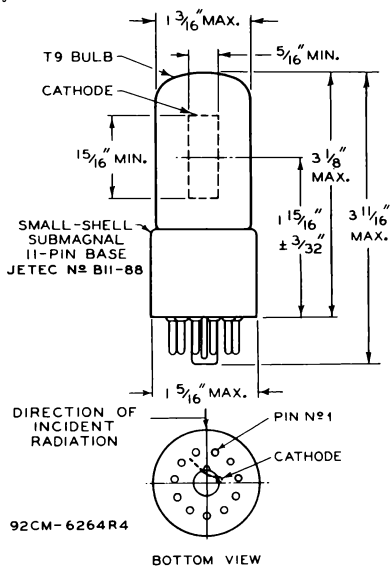
MULTIPLIER PHOTOTUBE

OPERATING CONSIDERATIONS

The *operating stability* of the IP28 is dependent on the magnitude of the anode current and its duration. When the IP28 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the IP28 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.5 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes, and the tube should be given a warm-up period of about 1/2 hour under load conditions.

Electrostatic and/or magnetic shielding of the IP28 may be necessary.



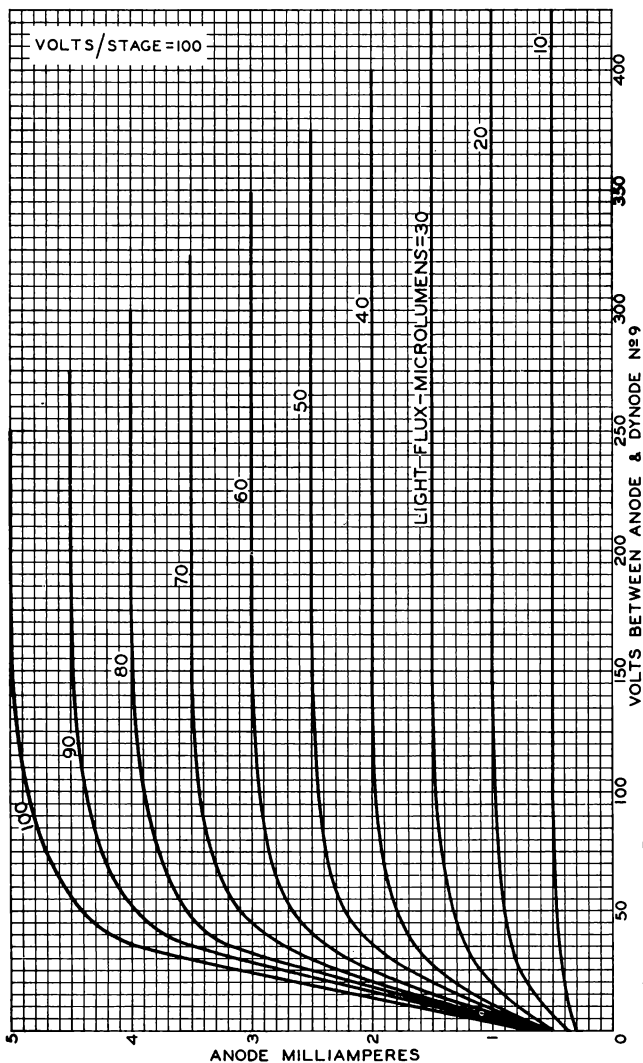
⊥ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

IP28



IP28

AVERAGE ANODE CHARACTERISTICS



MAY 6, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

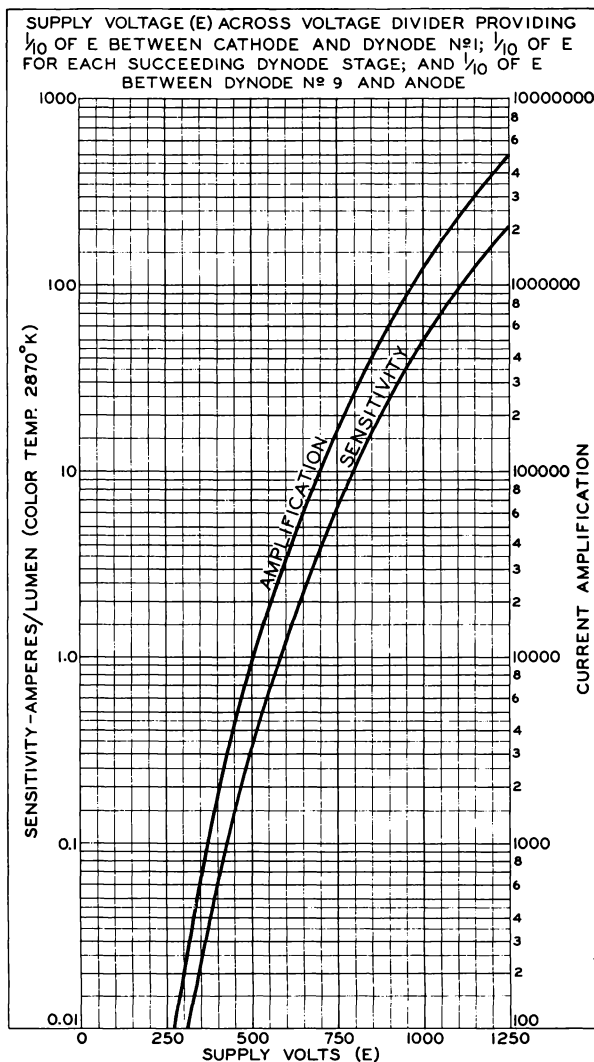
92CM-6632R3



IP28

IP28

AVERAGE CHARACTERISTICS



MAY 5, 1955

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

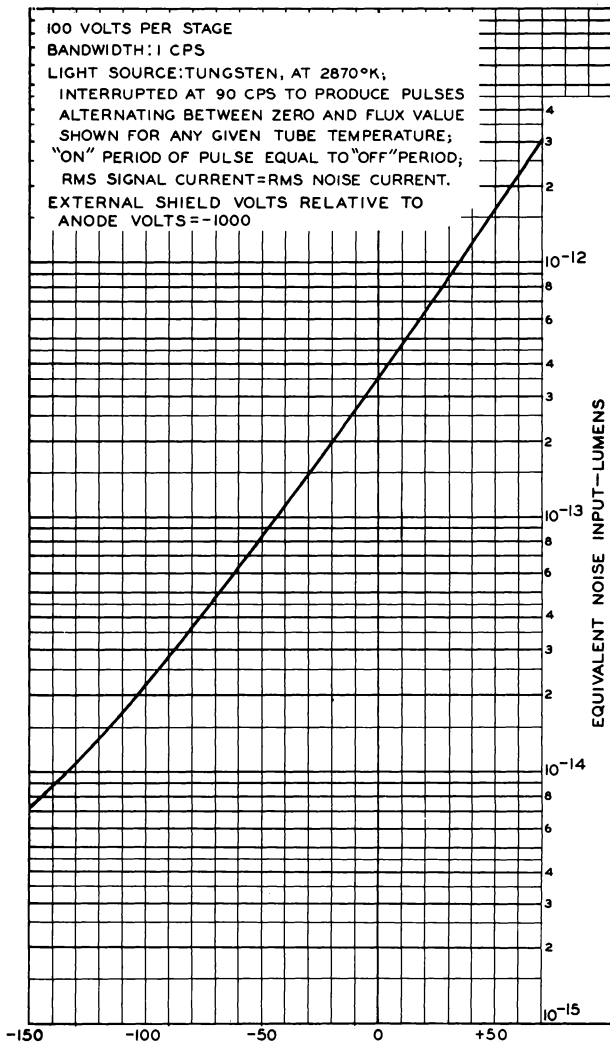
92CL-6547R3

IP28



IP28

EQUIVALENT-NOISE-INPUT CHARACTERISTIC



TUBE TEMPERATURE-DEGREES CENTIGRADE

MAY 7, 1955

TUBE DIVISION

92CM-7503R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



IP29

GAS PHOTOTUBE

WITH S-3 RESPONSE

IP29

DATA

General:

Spectral Response S-3

Wavelength of Maximum Response. 4200 ± 1000 Angstroms

Cathode:

Shape Semi-Cylindrical

Minimum Projected Length* $1\frac{1}{4}"$ ←Minimum Projected Width* $\frac{5}{8}"$ ←Direct Interelectrode Capacitance $3 \mu\text{f}$ Maximum Overall Length. $4\frac{1}{8}"$ Maximum Seated Length $3\frac{1}{2}"$ Seated Length to Center of Cathode. $2\frac{1}{8}" \pm \frac{3}{32}"$ Maximum Diameter. $1\frac{1}{8}"$ ←

Bulb. T-8

Mounting Position Any

Base. Dwarf-Shell Small 4-Pin ←

Basing Designation for BOTTOM VIEW. 2K

Pin 1—No
Connection
Pin 2—Anode



Pin 3—No
Connection
Pin 4—Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 100 max. volts

PEAK CATHODE CURRENT. 20 max. μamp ←PEAK CATHODE-CURRENT DENSITY. 100 max. $\mu\text{amp}/\text{sq. in.}$ AVERAGE CATHODE CURRENT^o 5 max. μamp ←AMBIENT TEMPERATURE 100 max. $^{\circ}\text{C}$

Characteristics:

	Min.	Av.	Max.
Dark Current at 90 Volts.	—	—	$0.10 \mu\text{amp}$

Sensitivity:

At 4200 Angstroms 0.01 $\mu\text{amp}/\mu\text{watt}$

Luminous:

At 0 Cycles 20 40 70 $\mu\text{amp}/\text{lumen}$ ←At 5000 Cycles. — 35 — $\mu\text{amp}/\text{lumen}$ At 10000 Cycles — 31 — $\mu\text{amp}/\text{lumen}$

Gas Amplification Factor. — — 9

* On plane perpendicular to indicated direction of incident light.

o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

← Indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

IP29



IP29

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less:

→	For dc currents	{	above 5 μ amp	..	0.1		megohm
			below 5 μ amp		No Minimum		

With anode-supply voltage of 100 volts:

→	For dc currents	{	above 3 μ amp	..	2.5	...	megohms
			below 3 μ amp	..	0.1	...	megohm

OUTLINE DIMENSIONS for Type 1P29
are the same as those for Type 1P37

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-3 Response
and

FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

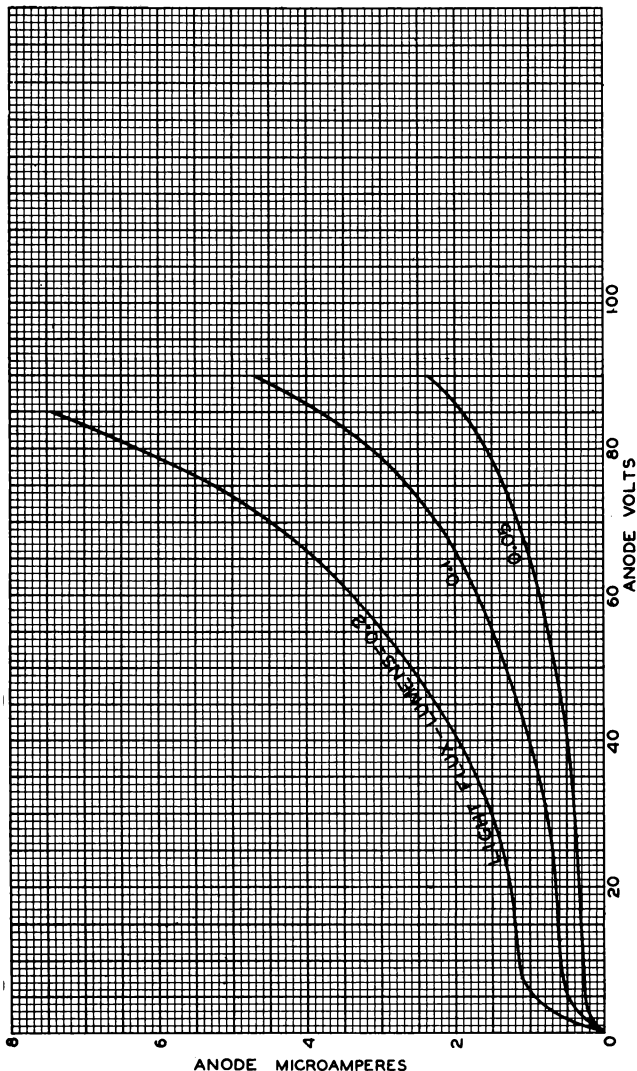
→ Indicates a change.



IP29

IP29

AVERAGE ANODE CHARACTERISTICS



AUG. 6, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6472RI



IP37

GAS PHOTOTUBE

WITH S-4 RESPONSE

IP37

DATA

General:

Spectral Response S-4

Wavelength of Maximum Response. 4000 ± 500 Angstroms

Cathode:

Shape Semi-Cylindrical

Minimum Projected Length* $1\frac{1}{4}$ "Minimum Projected Width* $\frac{5}{8}$ "Direct Interelectrode Capacitance $3 \mu\text{f}$ Maximum Overall Length. $4\frac{1}{8}$ "Maximum Seated Length $3\frac{1}{2}$ "Seated Length to Center of Cathode. $2\frac{1}{8}$ " $\pm \frac{3}{32}$ "Maximum Diameter. $1\frac{1}{8}$ "

Bulb. T-8

Mounting Position Any

Base. Dwarf-Shell Small 4-Pin

Basing Designation for BOTTOM VIEW. 2K

Pin 1 - No
Connection
Pin 2 - Anode



Pin 3 - No
Connection
Pin 4 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). . . 100 max. . . . volts

PEAK CATHODE CURRENT. 20 max. . . . μamp PEAK CATHODE-CURRENT DENSITY. 100 max. $\mu\text{amp/sq.in.}$ AVERAGE CATHODE CURRENT^o 5 max. . . . μamp AMBIENT TEMPERATURE 75 max. . . . $^{\circ}\text{C}$

Characteristics:

	Min.	Av.	Max.
Dark Current at 90 Volts. . .	-	-	$0.05 \mu\text{amp}$

Sensitivity:

At 4000 Angstroms 0.125 - $\mu\text{amp}/\mu\text{watt}$

Luminous:

At 0 Cycles 75 135 205 $\mu\text{amp/lumen}$ At 5000 Cycles. - 124 - $\mu\text{amp/lumen}$ At 10000 Cycles - 108 - $\mu\text{amp/lumen}$

Gas Amplification Factor. - 5.5

* On plane perpendicular to indicated direction of incident light.

o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

←Indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

IP37



IP37

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less:

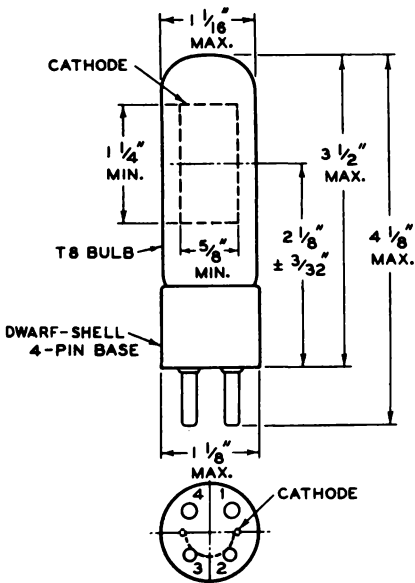
For dc currents	above 5 μ amp	0.1	megohm
	below 5 μ amp	No Minimum	

With anode-supply voltage of 100 volts:

For dc currents	above 3 μ amp	2.5	megohms
	below 3 μ amp	0.1	megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 1P37 are the same
as those shown under Type 5581



→ Indicates a change.

BOTTOM VIEW

92CM-470R4

AUGUST 15, 1947

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



IP39

VACUUM PHOTOTUBE

WITH S-4 RESPONSE

*For applications critical as to leakage
under high-humidity conditions*

IP39
IP40

The 1P39 is like the 929, except that the 1P39 has a maximum dark current of $0.005 \mu\text{a}$ at 250 volts, and has a non-hygroscopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse service conditions of high humidity.

← Indicates a change.



IP40

GAS PHOTOTUBE

WITH S-1 RESPONSE

*For applications critical as to leakage
under high-humidity conditions*

The 1P40 is like the 930, except that the 1P40 has a maximum dark current of $0.005 \mu\text{a}$ at 90 volts, and has a non-hygroscopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse service conditions of high humidity.

← Indicates a change.



IP41

GAS PHOTOTUBE

END TYPE WITH S-1 RESPONSE

IP41

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response.	8000 $\pm$ 1000 angstroms
Cathode:	
Shape	Circular
Minimum Diameter.	9/16"
Direct Interelectrode Capacitance	1.8 μf
Maximum Overall Length.	2-1/16" ←
Maximum Seated Length	1-19/32" ←
Maximum Diameter.	13/16"
Bulb.	T-6
Mounting Position	Any
Base.	Small-Shell Peewee 3-Pin
Basing Designation for BOTTOM VIEW	2F2

Pin 1 - No
ConnectionDIRECTION OF LIGHT
INTO END OF BULBPin 2 - Anode
Pin 3 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT.	5 max.	μamp
PEAK CATHODE-CURRENT DENSITY.	75 max. $\mu\text{amp/sq. in.}$	
AVERAGE CATHODE CURRENT ⁰	1.5 max.	μamp
AMBIENT TEMPERATURE	100 max.	$^{\circ}\text{C}$

Characteristics:

	<u>Min.</u>	<u>Avg.</u>	<u>Max.</u>	
DC Dark Current at 90 Volts:	-	-	0.1	μamp
Sensitivity:				
At 8000 angstroms	-	0.009	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: [▲]				
At 0 cps.	50	90	145	$\mu\text{amp}/\text{lumen}$
At 5000 cps	-	77	-	$\mu\text{amp}/\text{lumen}$
At 10000 cps.	-	67	-	$\mu\text{amp}/\text{lumen}$
Gas Amplification Factor.	-	-	8.5	

⁰ Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

[▲] Measured with .06 lumen.

← Indicates a change.

IP41



IP41

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

For dc currents { above 1.5 μ amp . . 0.1 . . . megohm
 below 1.5 μ amp . . No Minimum

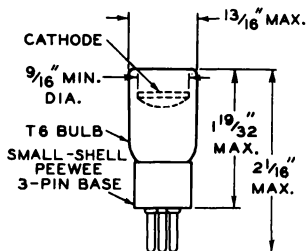
With anode-supply voltage of 90 volts:

For dc currents { above 1.0 μ amp . . 2.5 . . . megohms
 below 1.0 μ amp . . 0.1 . . . megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
 of Phototube having S-1 Response
 and

FREQUENCY-RESPONSE CHARACTERISTICS
 of Gas Phototubes

are shown at the front of this Section



92CS-6676RI

→ Indicates a change.

NOV. 1, 1950

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

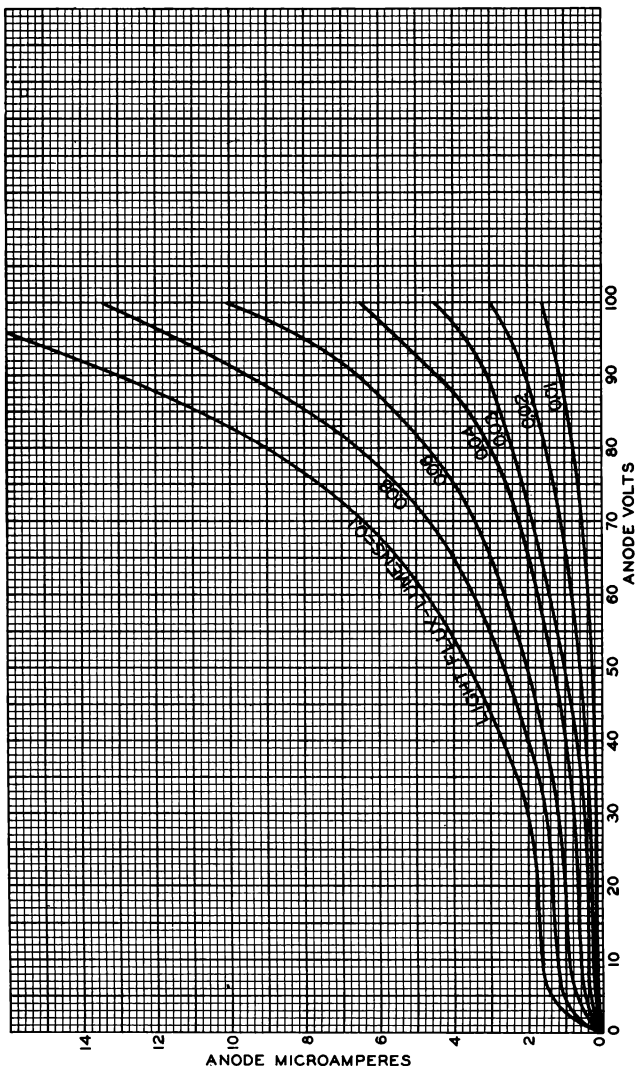
DATA



IP41

IP41

AVERAGE ANODE CHARACTERISTICS



DEC. 13, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5217R3



IP42

VACUUM PHOTOTUBE

END TYPE WITH S-9 RESPONSE

IP42

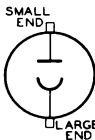
DATA

General:

Spectral Response	S-9	←
Wavelength of Maximum Response.	4800 ± 500 angstroms	←
Cathode:		
Shape	Circular	
Window Area	0.030 sq.in.	
Minimum Diameter.	0.19"	
Direct Interelectrode Capacitance	1.9 μ mf	←
Overall Length.	1-11/32" ± 1/16"	
Maximum Diameter.	1/4"	
Bulb.	T-2	
Mounting Position	Any	

TERMINAL CONNECTIONS

Small End: Anode



Large End: Cathode

DIRECTION OF LIGHT
INTO END OF BULB

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	180 max.	volts
PEAK CATHODE CURRENT.	1.5 max.	μ amp
PEAK CATHODE-CURRENT DENSITY.	100 max. μ amp/sq.in.	
AVERAGE CATHODE CURRENT ^o	0.4 max.	μ amp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
Dark Current at 180 Volts	-	-	0.005	μ amp
Sensitivity:				
At 4800 Angstroms	-	0.020	-	μ amp/ μ watt
Luminous [▲]	20	30	50	μ amp/lumen

^o Averaged over any interval of 30 seconds maximum.[▲] Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS", at the front of this Section, except that the anode supply is 180 volts and the light flux is 0.015 lumen.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-9 Response
is shown at the front of this Section

← Indicates a change.

JULY 3, 1950

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

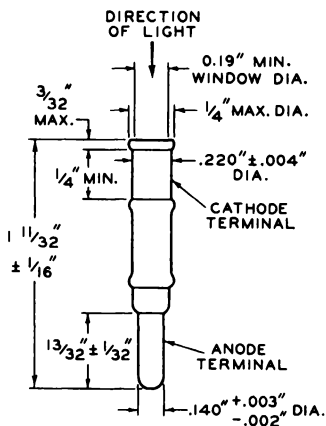
DATA

IP42



IP42

VACUUM PHOTOTUBE



NOTE: WHEN TUBE IS ROTATED ABOUT THE LONGITUDINAL AXIS OF ITS CATHODE TERMINAL, NO PART OF THE ANODE TERMINAL WILL FALL OUTSIDE OF A 0.241"-DIAMETER CIRCLE CONCENTRIC WITH THE LONGITUDINAL AXIS OF THE CATHODE TERMINAL.

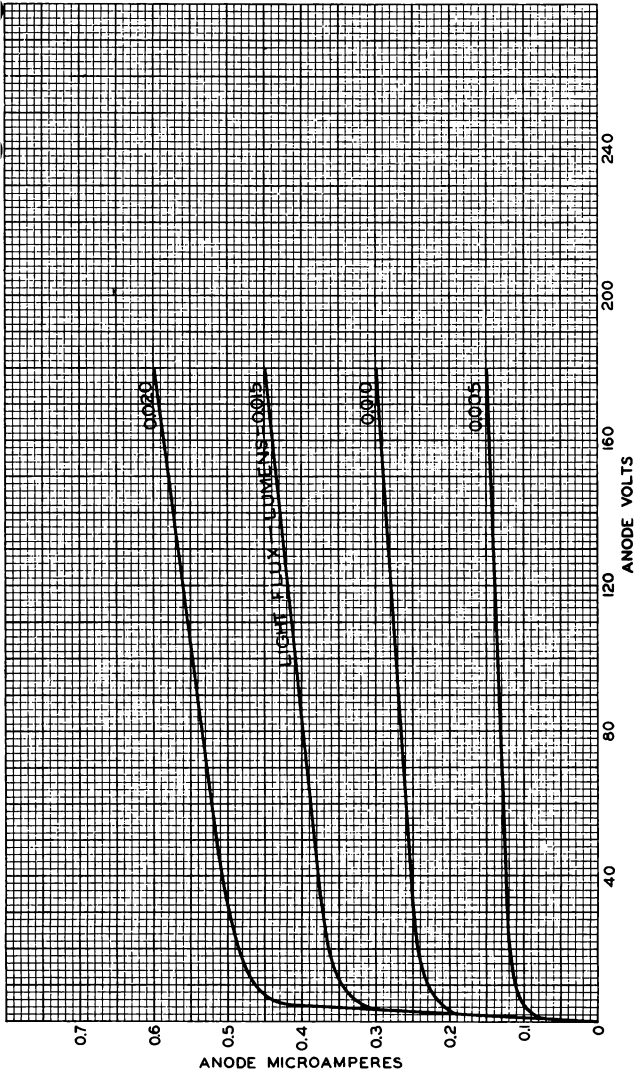
92CS-6791R2



IP42

IP42

AVERAGE ANODE CHARACTERISTICS



APRIL 7, 1950

TUBE DEPARTMENT

92CM-6783R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



868

868 GAS PHOTOTUBE

WITH S-1 RESPONSE

DATA**General:**

Spectral Response S-1
Wavelength of Maximum Response. 8000 ± 1000 Angstroms
Cathode:
Shape Semi-Cylindrical
Minimum Projected Length* 1-1/4"
Minimum Projected Width* 5/8"
Direct Interelectrode Capacitance 3 μf
Maximum Overall Length. 4-1/8"
Maximum Seated Length 3-1/2"
Seated Length to Center of Cathode. 2-1/8" $\pm 3/32$ "
Maximum Diameter. 1-1/8"
Bulb. T-8
Mounting Position Any
Base. Dwarf-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW. 2K

Pin 1 - No
Connection
Pin 2 - Anode



Pin 3 - No
Connection
Pin 4 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 100 max. volts
PEAK CATHODE CURRENT. 20 max. μamp
PEAK CATHODE-CURRENT DENSITY. 100 max. $\mu\text{amp/sq.in.}$
AVERAGE CATHODE CURRENT^o. 5 max. μamp
AMBIENT TEMPERATURE 100 max. $^{\circ}\text{C}$

Characteristics:

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>
Dark Current at 90 Volts.	-	-	0.1 . . . μamp
Sensitivity:			
At 8000 Angstroms	-	0.009	- $\mu\text{amp}/\mu\text{watt}$
Luminous:			
At 0 Cycles	50	90	145 $\mu\text{amp}/\text{lumen}$
At 5000 Cycles	-	77	- $\mu\text{amp}/\text{lumen}$
At 10000 Cycles	-	67	- $\mu\text{amp}/\text{lumen}$
Gas Amplification Factor.	-	-	8

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

← Indicates a change.

868



868 GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less:

→ For dc currents {	above 5 μ amp . .	0.1	megohm
	below 5 μ amp . .	No Minimum	

With anode-supply voltage of 100 volts:

→ For dc currents {	above 3 μ amp . .	2.5	megohms
	below 3 μ amp . .	0.1	megohm

OUTLINE DIMENSIONS for Type 868
are the same as those for Type 1P37

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 868 are the same
as those shown under Type 1P41

→ Indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA



917

917

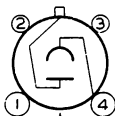
VACUUM PHOTOTUBE

LOW-LEAKAGE TYPE WITH ANODE-TERMINAL CAP AND S-1 RESPONSE

*For light-measuring and relay applications***DATA****General:**

Spectral Response.	S-1
Wavelength of Maximum Response	8000 $\pm$ 1000 angstroms
Cathode:	
Shape.	Semicylindrical
Minimum projected length*.	1-9/16"
Minimum projected width*.	5/8"
Direct Interelectrode Capacitance.	2.2 μ mf
Maximum Overall Length.	4-7/16"
Seated Length.	3-11/16" $\pm$ 1/8"
Seated Length to Center of Cathode	2-1/8" $\pm$ 3/32"
Maximum Diameter.	1-1/8"
Mounting Position.	Any
Weight (Approx.)	1.1 oz
Bulb	T-8
Cap.	Small (JEDEC No. C1-1)
Base	Dwarf-Shell Small 4-Pin (JEDEC No. A4-26)
Basing Designation for BOTTOM VIEW	1A

Pin 1—No Connection
Pin 2—No Connection



DIRECTION OF LIGHT

Pin 3—No Connection
Pin 4—Cathode
Cap—Anode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max.	volts
AVERAGE CATHODE-CURRENT DENSITY ^o	30 max.	μ amp/sq. in.
AVERAGE CATHODE CURRENT ^o	10 max.	μ amp
AMBIENT TEMPERATURE	100 max.	$^{\circ}$ C

Characteristics, At 250 Volts on Anode:

Min. Median Max.

Sensitivity:

Radiant, at				
8000 angstroms	—	0.0018	—	μ amp/ μ watt
Luminous [▲]	12	20	40	μ amp/lumen
Anode Dark Current				
at 25 $^{\circ}$ C.	—	—	0.005	μ amp

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum.[▲] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870 $^{\circ}$ K. A dc anode supply of 250 volts, a 1-megohm load resistor, and a light input of 0.1 lumen are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at front of this Section

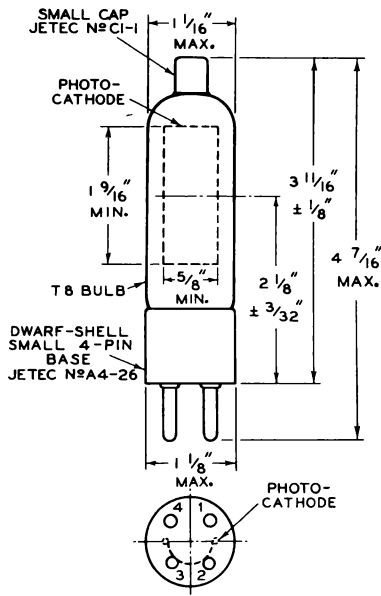
← Indicates a change.

917



917

VACUUM PHOTOTUBE



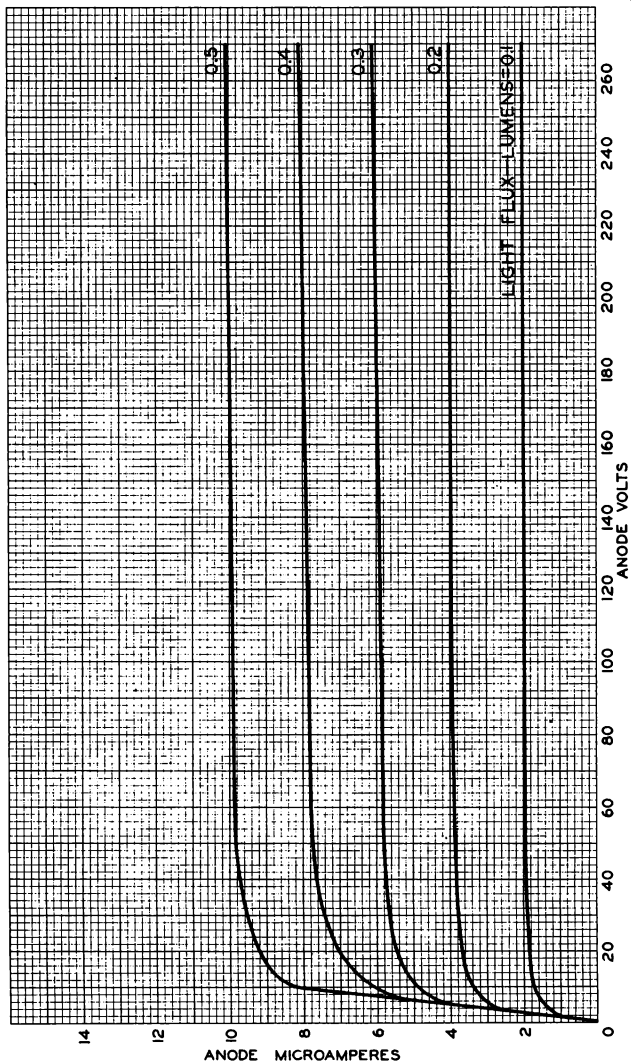
92CS-4359R6



917

917

AVERAGE ANODE CHARACTERISTICS





9/8

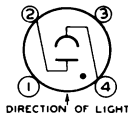
918 GAS PHOTOTUBE

WITH S-1 RESPONSE

DATA**General:**

Spectral Response S-1
 Wavelength of Maximum Response. . . . 8000 $\pm$ 1000 Angstroms
 Cathode:
 Shape Semi-Cylindrical
 Minimum Projected Length* 1-1/4"
 Minimum Projected Width* 5/8"
 Direct Interelectrode Capacitance 3 μ f
 Maximum Overall Length. 4-1/8"
 Maximum Seated Length 3-1/2"
 Seated Length to Center of Cathode. 2-1/8" $\pm$ 3/32"
 Maximum Diameter. 1-1/8"
 Bulb. T-8
 Mounting Position Any
 Base. Dwarf-Shell Small 4-Pin
 Basing Designation for BOTTOM VIEW. 2K

Pin 1—No
 Connection
 Pin 2—Anode



Pin 3—No
 Connection
 Pin 4—Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max. . . .	volts
PEAK CATHODE CURRENT.	20 max. . . .	μ amp
PEAK CATHODE-CURRENT DENSITY. . . .	100 max. μ amp/sq. in.	
AVERAGE CATHODE CURRENT ^o	5 max. . . .	μ amp
AMBIENT TEMPERATURE	100 max. . . .	$^{\circ}$ C

Characteristics:

	<u>Min.</u>	<u>Average</u>	<u>Max.</u>	
Dark Current at 90 Volts.	—	—	0.1 . . .	μ amp
Sensitivity:				
At 8000 Angstroms	—	0.015	—	μ amp/ μ watt
Luminous:				
At 0 Cycles	120	150	220	μ amp/lumen
At 5000 Cycles.	—	120	—	μ amp/lumen
At 10000 Cycles	—	105	—	μ amp/lumen
Gas Amplification Factor.	—	—	7.0	

* on plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

← Indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA



918

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

→ For dc currents {	above 5 μ amp . . .	0.1 . . .	megohm
	below 5 μ amp . . .	No Minimum	

With anode-supply voltage of 90 volts:

→ For dc currents {	above 3 μ amp . . .	2.5 . . .	megohms
	below 3 μ amp . . .	0.1 . . .	megohm

OUTLINE DIMENSIONS for Type 918
are the same as those for Type 1P37

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and

FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

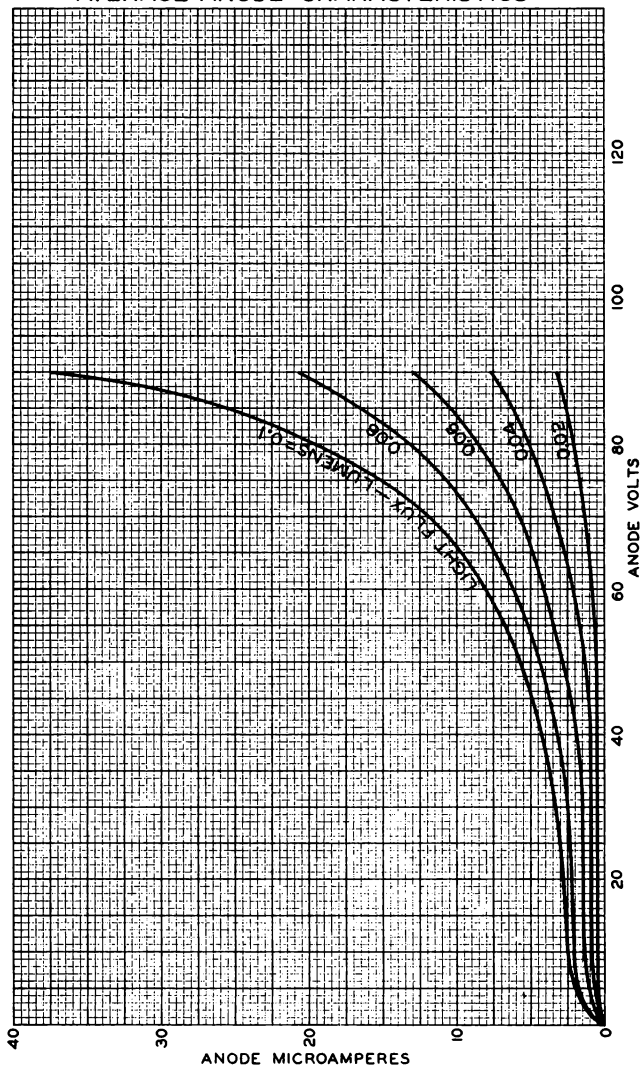
→ Indicates a change.



918

918

AVERAGE ANODE CHARACTERISTICS



APRIL 7, 1950

TUBE DEPARTMENT

92CM-4351R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



919

VACUUM PHOTOTUBE

LOW-LEAKAGE TYPE WITH CATHODE-TERMINAL CAP AND S-I RESPONSE

For light-measuring and relay applications

The 919 is the same as the 917 except for the following item:

General:

Base Dwarf-Shell Small 4-Pin (JETEC No.A4-26)

Basing Designation for BOTTOM VIEW 1B

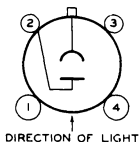
Pin 1 - No Connection

Pin 2 - Anode

Pin 3 - No Connection

Pin 4 - No Connection

Cap - Cathode





920

GAS PHOTOTUBE

TWIN TYPE WITH S-1 RESPONSE

920

DATA**General:**

Spectral Response S-1
 Wavelength of Maximum Response. 8000 $\pm$ 1000 Angstroms
 Cathodes (Each):

Shape Quarter-Cylindrical
 Minimum Projected Length* 1-3/16"
 Minimum Projected Width* 1/4"

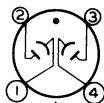
Direct Interelectrode Capacitances:

Cathode to Anode $\blacklozenge$ 1.6 μ f
 Cathode to Cathode $\square$ 1.8 μ f
 Anode to Anode $\bullet$ 0.44 μ f

Maximum Overall Length. 4"
 Maximum Seated Length 3-3/8"
 Seated Length to Center of Cathode. 2-1/8" $\pm$ 3/32"
 Maximum Diameter. 1-3/16"
 Bulb. T-9
 Mounting Position Any
 Base. Small-Shell Small 4-Pin

BOTTOM VIEW

Pin 1-Cathode,
Unit No.2
 Pin 2-Anode,
Unit No.2



Pin 3-Anode,
Unit No.1
 Pin 4-Cathode,
Unit No.1

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values (Each Unit):

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 90 max. . . . volts
 PEAK CATHODE CURRENT. 6 max. . . . μ amp
 PEAK CATHODE-CURRENT DENSITY. 50 max. μ amp/sq. in.
 AVERAGE CATHODE CURRENT $\circ$ 2 max. . . . μ amp
 AMBIENT TEMPERATURE 100 max. . . . $^{\circ}$ C

Characteristics:

	<u>Min.</u>	<u>Avg.</u>	<u>Max.</u>
Dark Current at 90 Volts.	-	-	0.1 μ amp
Sensitivity:			
At 8000 Angstroms	-	0.010	- μ amp/ μ watt
Luminous: $\blacktriangle$			
At 0 Cycles	50	100	175 μ amp/lumen
At 5000 Cycles.	-	85	- μ amp/lumen
At 10000 Cycles	-	74	- μ amp/lumen
Gas Amplification Factor.	-	-	9

* On plane perpendicular to indicated direction of incident light.

 $\blacklozenge$ Each unit, with other unit grounded. $\square$ Anodes grounded. $\bullet$ Cathodes grounded. $\circ$ Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts. $\blacktriangle$ Measured with .04 lumen. $\leftarrow$ Indicates a change.

920



920

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

→ For dc currents {	above 2 μ amp . . .	0.1 . . .	megohm
	below 2 μ amp . . .	No Minimum	

With anode-supply voltage of 90 volts:

→ For dc currents {	above 1 μ amp . . .	2.5 . . .	megohms
	below 1 μ amp . . .	0.1 . . .	megohm

OUTLINE DIMENSIONS for Type 920
are the same as those for Type 5584

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and

FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

→ indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT

DATA

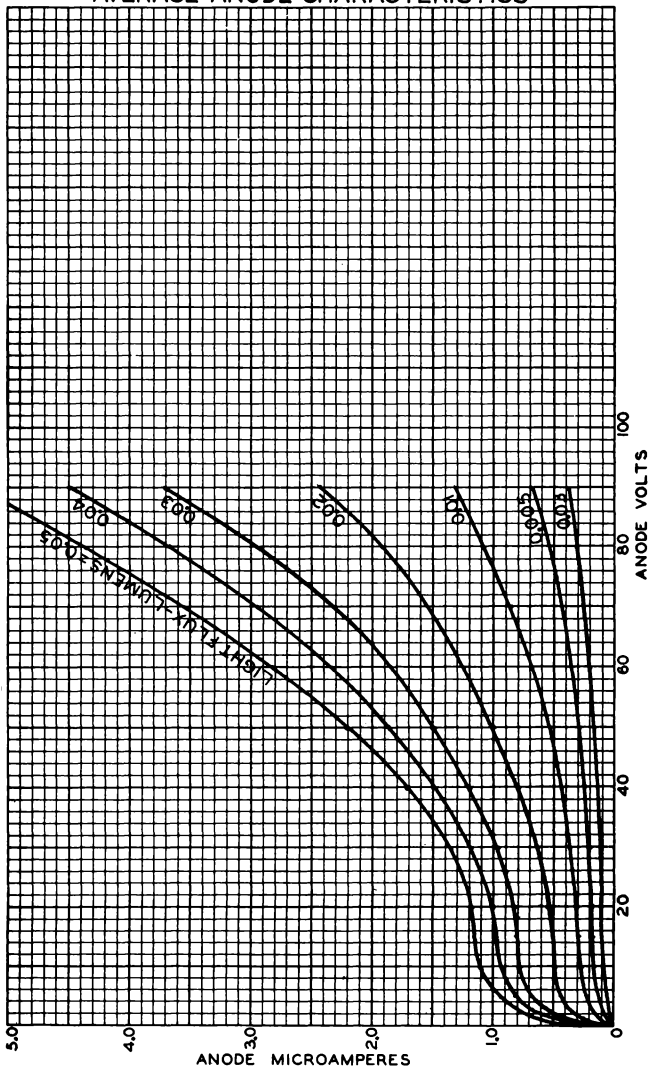
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



920

920

AVERAGE ANODE CHARACTERISTICS



SEPT. 19, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4618R3



921

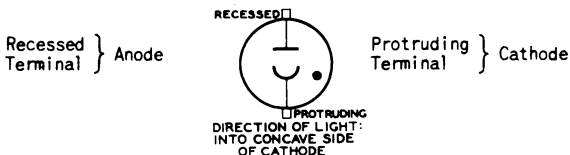
GAS PHOTOTUBE

CARTRIDGE TYPE WITH S-1 RESPONSE

921

DATA**General:**

Spectral Response S-1
 Wavelength of Maximum Response. 8000 $\pm$ 1000 Angstroms
 Cathode:
 Shape Semi-Cylindrical
 Minimum Projected Length* 7/8"
 Minimum Projected Width* 1/2"
 Direct Interelectrode Capacitance 1.0 μ f
 Overall Length. 1-21/32" $\pm$ 1/16"
 Seated Length 1-13/32" $\pm$ 1/32"
 Length, Cathode Center to plane A-A' (See outline) 11/16" $\pm$ 1/16"
 Maximum Diameter. 0.890"
 Mounting Position Any
 Terminal Caps See Outline

BOTTOM VIEW**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT.	10 max.	μ amp
PEAK CATHODE-CURRENT DENSITY.	100 max. μ amp/sq. in.	
AVERAGE CATHODE CURRENT ^o	3 max.	μ amp
AMBIENT TEMPERATURE	100 max.	$^{\circ}$ C

Characteristics:

	<u>Nin.</u>	<u>Av.</u>	<u>Max.</u>	
Dark Current at 90 Volts.	—	—	0.1	μ amp
Sensitivity:				
At 8000 Angstroms	—	0.0135	—	μ amp/ μ watt
Luminous: [▲]				
At 0 Cycles	75	135	205	μ amp/lumen
At 5000 Cycles.	—	119	—	μ amp/lumen
At 10000 Cycles	—	108	—	μ amp/lumen
Gas Amplification Factor.	—	—	10	

* On plane perpendicular to indicated direction of incident light.

o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS", at the front of this Section.

← Indicates a change.



921

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

For dc currents { above 3 μ amp . . . 0.1 . . . megohm
 below 3 μ amp . . . No Minimum

With anode-supply voltage of 90 volts:

For dc currents { above 2 μ amp . . . 2.5 . . . megohms
 below 2 μ amp . . . 0.1 . . . megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC

of Phototube having S-1 Response

and

FREQUENCY-RESPONSE CHARACTERISTICS

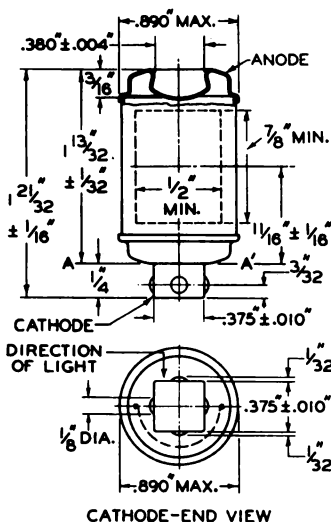
of Gas Phototubes

are shown at the front of this Section

AVERAGE ANODE CHARACTERISTICS

of Type 921 are the same

as those shown under Type 930



92CM-4789R4



922

VACUUM PHOTOTUBE

CARTRIDGE TYPE WITH S-1 RESPONSE

For relay applications

922

DATA

General:

Spectral Response S-1

Wavelength of Maximum Response. 8000 $\pm$ 1000 angstroms

Cathode:

Shape Semicylindrical

Minimum projected length* 5/8"

Minimum projected width* 1/2"

Direct Interelectrode Capacitance 1 $\mu\mu\text{f}$ Overall Length. 1-21/32" + 1/32" - 1/16" $\leftarrow$ Seated Length 1-13/32" $\pm$ 1/32" $\leftarrow$

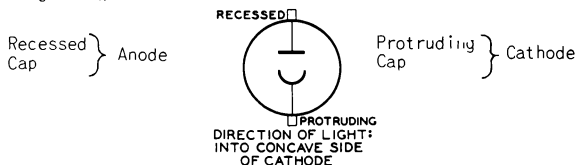
Length from Center of Useful Cathode Area

to Plane A-A' (See Dimensional Outline) 11/16" $\pm$ 1/16"

Maximum Diameter. 0.890"

Mounting Position Any $\leftarrow$ Weight (Approx.). 0.4 oz $\leftarrow$

Terminals:

Recessed cap. JETEC No. J1-23 $\leftarrow$ Protruding cap. JETEC No. J1-24 $\leftarrow$ Basing Designation. 2A9 $\leftarrow$ 

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 500 max. volts $\leftarrow$ AVERAGE CATHODE-CURRENT DENSITY^o. 30 max. $\mu\text{amp/sq. in.}$ $\leftarrow$ AVERAGE CATHODE CURRENT^o. 5 max. μamp $\leftarrow$ AMBIENT TEMPERATURE 100 max. $^{\circ}\text{C}$

Characteristics, At 250 Volts on Anode:

Min. Median Max.

Sensitivity:

Radiant, at

8000 angstroms. - 0.0018 - $\mu\text{amp}/\mu\text{watt}$ $\leftarrow$ Luminous[▲]. 10 20 40 $\mu\text{amp/lumen}$

Anode Dark Current

at 25 $^{\circ}\text{C}$ - - 0.005 μamp

* On plane perpendicular to indicated direction of incident light.

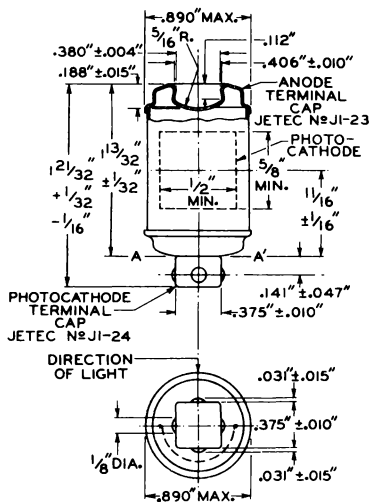
o Averaged over any interval of 30 seconds maximum.

▲ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870 $^{\circ}\text{K}$. A dc anode supply of 250 volts, a 1-megohm load resistor, and a light input of 0.1 lumen are used.

 $\leftarrow$ Indicates a change.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at the front of this Section

AVERAGE ANODE CHARACTERISTICS
for Type 922 are the same as those shown for Type 917



A-A' = PLANE PERPENDICULAR
TO AXIS OF TUBE

92CM-4818R5



923

GAS PHOTOTUBE

WITH S-1 RESPONSE

DATA

General:

Spectral Response S-1
 Wavelength of Maximum Response. 8000 $\pm$ 1000 Angstroms
 Cathode:
 Shape Semi-Cylindrical
 Minimum Projected Length* 13/16"
 Minimum Projected Width* 5/8"
 Direct Interelectrode Capacitance 2 μ mf
 Maximum Overall Length. 3-9/16"
 Maximum Seated Length 2-15/16"
 Seated Length to Center of Cathode. 1-31/32" $\pm$ 3/32"
 Maximum Diameter. 1-3/16"
 Bulb. T-9
 Mounting Position Any
 Base. Small-Shell Small 4-Pin
 Basing Designation for BOTTOM VIEW. 2K

Pin 1 - No
 Connection
 Pin 2 - Anode

Pin 3 - No
 Connection
 Pin 4 - Cathode

DIRECTION OF LIGHT

Maximum Ratings, Characteristics, and Curves
 for the 923
 are the same as those shown
 for Type 930

* On plane perpendicular to indicated direction of incident light.

← Indicates a change.

AUGUST 15, 1947

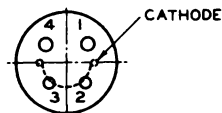
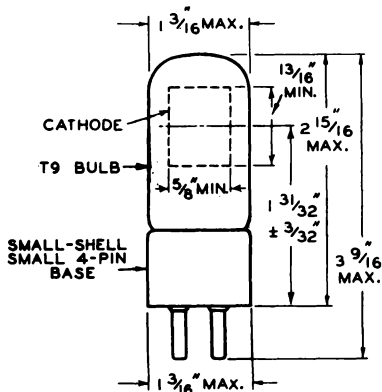
TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

923



923 GAS PHOTOTUBE



BOTTOM VIEW

92CM-4788R3



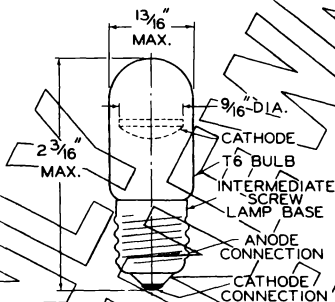
924 GAS PHOTOTUBE

END TYPE
RED—INFRARED SENSITIVE

924

The 924 is the same electrically as the 1P41 with the exception of its interelectrode capacitance. Mechanically, the 924 and 1P41 differ as to base, base connections, and overall length.

Direct Interelectrode Capacitance 2.6 μ f
Overall Length $2\frac{1}{16}$ " $\pm$ $\frac{1}{8}$ "
Base Intermediate Screw



92C-6042RI



925

925

VACUUM PHOTOTUBE

SHORT TYPE WITH S-1 RESPONSE

DATA**General:**

Spectral Response S-1

Wavelength of Maximum Response. 8000 ± 1000 Angstroms**Cathode:**

Shape Semi-Cylindrical

Minimum Projected Length* $13/16"$ Minimum Projected Width* $5/8"$ Direct Interelectrode Capacitance $1.6 \mu\text{mf}$ Maximum Overall Length. $2-5/8"$ Maximum Seated Length $2-1/16"$ Seated Length to Center of Cathode. $1-9/32" \pm 3/32"$ Maximum Diameter. $1-9/32"$

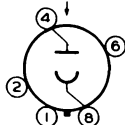
Bulb. T-9

Mounting Position Any

Base. Intermediate-Shell Octal 5-Pin

Basing Designation for BOTTOM VIEW. 3J

DIRECTION OF LIGHT

Pin 1 - No
ConnectionPin 2 - No
ConnectionPin 4 - Anode
Pin 6 - No
Connection
Pin 8 - Cathode**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 250 max. volts

PEAK CATHODE CURRENT. 15 max. μamp PEAK CATHODE-CURRENT DENSITY. 100 max. $\mu\text{amp/sq. in.}$ AVERAGE CATHODE CURRENT^o. 5 max. μamp AMBIENT TEMPERATURE 100 max. $^{\circ}\text{C}$ **Characteristics:**

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
Dark Current at 250 Volts . .	-	-	0.0125	μamp

Sensitivity:At 8000 Angstroms - 0.0015 - $\mu\text{amp}/\mu\text{watt}$ Luminous. 10 20 40 $\mu\text{amp}/\text{lumen}$

* on plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at the beginning of this Section

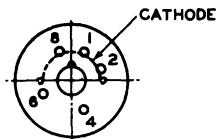
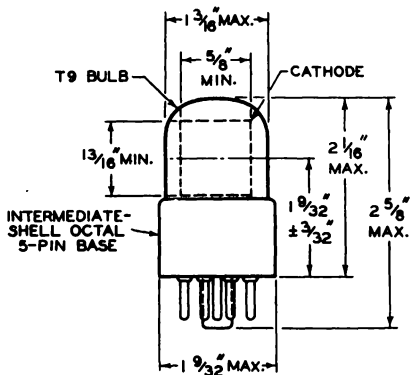
← Indicates a change.

925



925

VACUUM PHOTOTUBE



BOTTOM VIEW

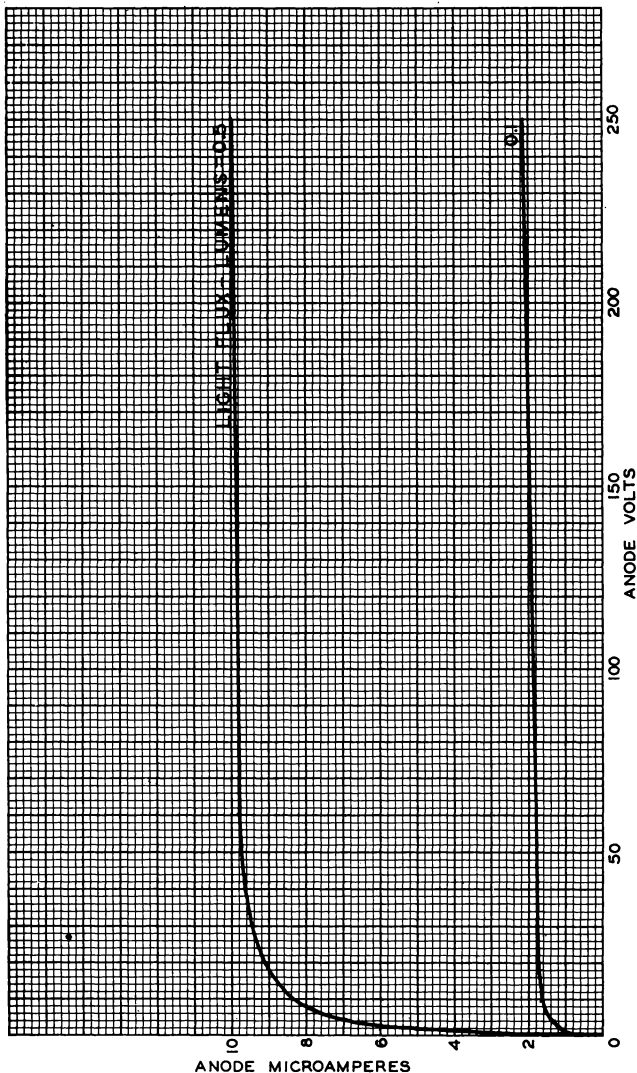
92CM-6054R2



925

925

AVERAGE ANODE CHARACTERISTICS



JULY 31, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6208R1



926

VACUUM PHOTOTUBE

CARTRIDGE TYPE WITH S-3 RESPONSE

926

DATA**General:**

Spectral Response	S-3
Wavelength of Maximum Response. . . .	4200 $\pm$ 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	7/8"
Minimum Projected Width*	1/2"
Direct Interelectrode Capacitance	1 μ f
Overall Length.	1-21/32" $\pm$ 1/16"
Seated Length	1-13/32" $\pm$ 1/32"
Length, Cathode Center to plane A-A' (See Outline)	11/16" $\pm$ 1/16"
Maximum Diameter.	0.890"
Mounting Position	Any
Terminal Caps	See Outline

BOTTOM VIEW

RECESSED

Recessed } Anode
Terminal }



Protruding } Cathode
Terminal }

PROTRUDING
DIRECTION OF LIGHT:
INTO CONCAVE SIDE
OF CATHODE

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max.	volts
PEAK CATHODE CURRENT.	15 max.	μ amp
PEAK CATHODE-CURRENT DENSITY.	100 max. μ amp/sq.in.	
AVERAGE CATHODE CURRENT ^o	5 max.	μ amp
AMBIENT TEMPERATURE	100 max.	$^{\circ}$ C

Characteristics:

	<u>Min.</u>	<u>Au.</u>	<u>Max.</u>	
Dark Current at 250 Volts	-	-	0.005	μ amp
Sensitivity:				
At 4200 Angstroms	-	0.0016	-	μ amp/ μ watt
Luminous [▲]	4	6.5	15	μ amp/lumen

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum.[▲] Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS" at the front of this Section.

OUTLINE DIMENSIONS for Type 926
are the same as those for Type 921

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-3 Response
is shown at the front of this Section

← Indicates a change.

JUNE 15, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

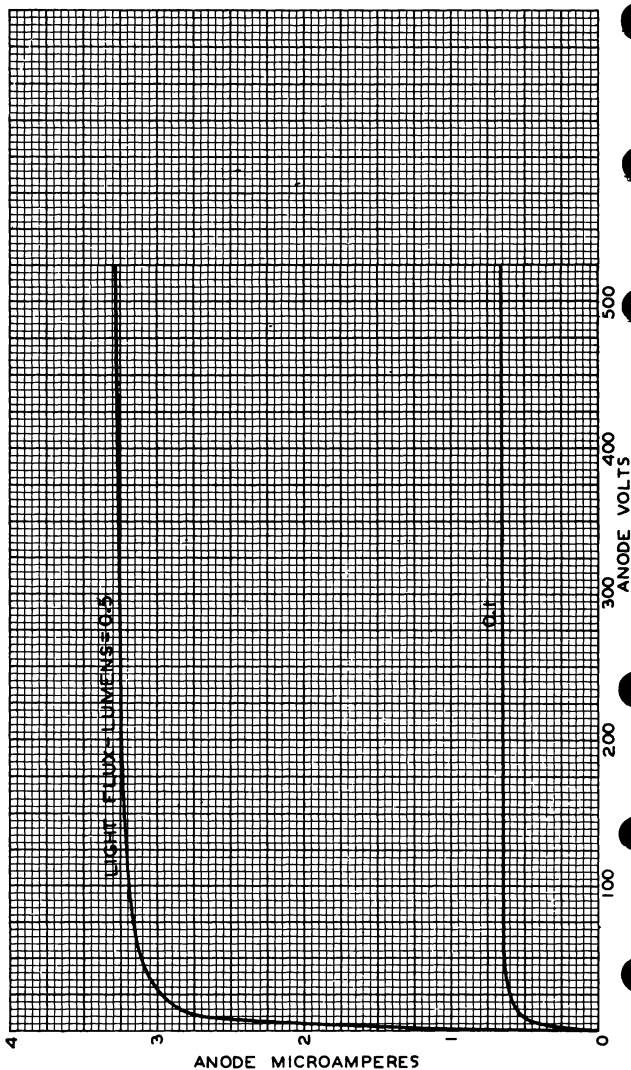
DATA

926



926

AVERAGE ANODE CHARACTERISTICS



AUG. 4, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 6209RI



927

927 GAS PHOTOTUBE

WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response.	8000 $\pm$ 1000 angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	11/16"
Minimum Projected Width*	7/16"
Direct Interelectrode Capacitance	2 μ f
Maximum Overall Length.	2-13/32" ←
Maximum Seated Length	1-15/16" ←
Seated Length to Center of Cathode.	1-1/4" $\pm$ 3/32"
Maximum Diameter.	0.669" ←
Bulb.	T-5-1/4" ←
Mounting Position	Any
Base.	Small-Shell Peewee 3-Pin
Basing Designation for BOTTOM VIEW.	2F

Pin 1—No
Connection

DIRECTION OF LIGHT



Pin 2—Anode
Pin 3—Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT.	6 max.	μ amp
PEAK CATHODE-CURRENT DENSITY.	100 max. μ amp/sq.in.	
AVERAGE CATHODE CURRENT ^o	2 max.	μ amp
AMBIENT TEMPERATURE	100 max.	$^{\circ}$ C

Characteristics:

	<u>Min.</u>	<u>Au.</u>	<u>Max.</u>	
DC Dark Current [■]	—	—	0.1	μ amp
Sensitivity:				
At 8000 angstroms	—	0.0125	—	μ amp/ μ watt
Luminous:				
At 0 cps.	75	125	185	μ amp/lumen
At 5000 cps	—	110	—	μ amp/lumen
At 10000 cps.	—	100	—	μ amp/lumen
Gas Amplification Factor.	—	—	10	

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

■ At 25 $^{\circ}$ C and 90 volts.

← Indicates a change.

SEPT. 1, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA



927 GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

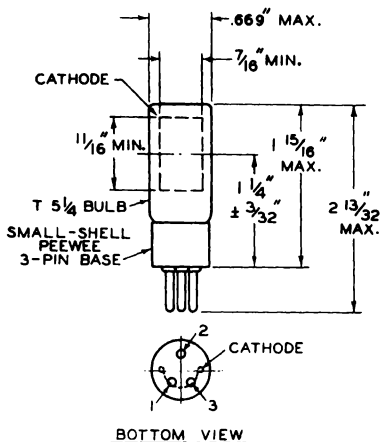
With anode-supply voltage of 70 volts or less:

For dc currents { above 2 μ amp . . . 0.1 . . . megohm
below 2 μ amp . . . No Minimum

With anode-supply voltage of 90 volts:

For dc currents { above 1.0 μ amp . . . 2.5 . . . megohms
below 1.0 μ amp . . . 0.1 . . . megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section



92CM-6053R4

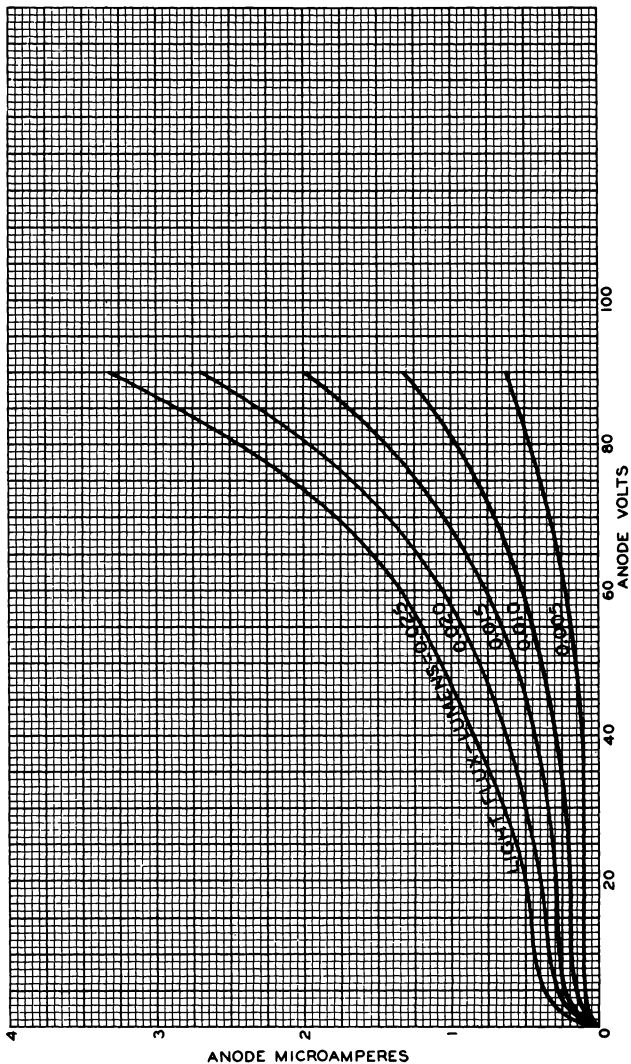
→ Indicates a change.



927

927

AVERAGE ANODE CHARACTERISTICS



APRIL 5, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6256R2



928

GAS PHOTOTUBE

NON-DIRECTIONAL TYPE WITH S-1 RESPONSE

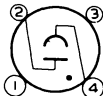
928

DATA

General:

Spectral Response S-1
Wavelength of Maximum Response. 8000 $\pm$ 1000 Angstroms
Cathode:
Shape Cylindrical Mesh
Minimum Length. 13/16"
Minimum Diameter. 5/8"
Direct Interelectrode Capacitance 3 μ f
Maximum Overall Length. 3-9/16"
Maximum Seated Length 2-15/16"
Seated Length to Center of Cathode. 1-31/32" $\pm$ 3/32"
Maximum Diameter. 1-3/16"
Bulb. T-9
Mounting Position Any
Base. Small-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW. 2K1

Pin 1 - No
Connection
Pin 2 - Anode



Pin 3 - No
Connection
Pin 4 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 90 max. . . . volts
PEAK CATHODE CURRENT. 10 max. . . . μ amp
PEAK CATHODE-CURRENT DENSITY. 100 max. μ amp/sq. in.
AVERAGE CATHODE CURRENT^o. 3 max. . . . μ amp
AMBIENT TEMPERATURE 100 max. . . . $^{\circ}$ C

Characteristics:

	Min.	Avg.	Max.
Dark Current at 90 Volts.	-	-	0.1 . . . μ amp
Sensitivity:			
At 8000 Angstroms	-	0.0065	- μ amp/ μ watt
Luminous:			
At 0 Cycles	40	65	100 μ amp/lumen
At 5000 Cycles.	-	56	- μ amp/lumen
At 10000 Cycles	-	50	- μ amp/lumen
Gas Amplification Factor.	-	-	10

^o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

←Indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA



928 GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

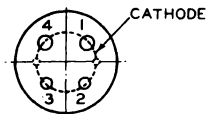
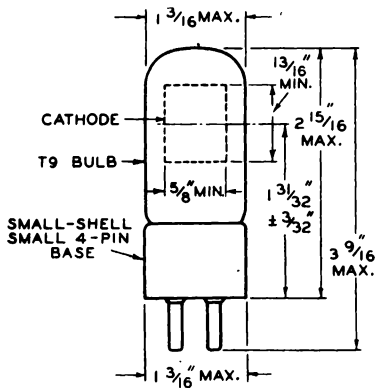
With anode-supply voltage of 70 volts or less:

→ For dc currents	above 3 μ amp	...	0.1	...	megohm
	below 3 μ amp	...	No Minimum		

With anode-supply voltage of 90 volts:

→ For dc currents	above 2 μ amp	...	2.5	...	megohms
	below 2 μ amp	...	0.1	...	megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section



BOTTOM VIEW

92CM-6111R2

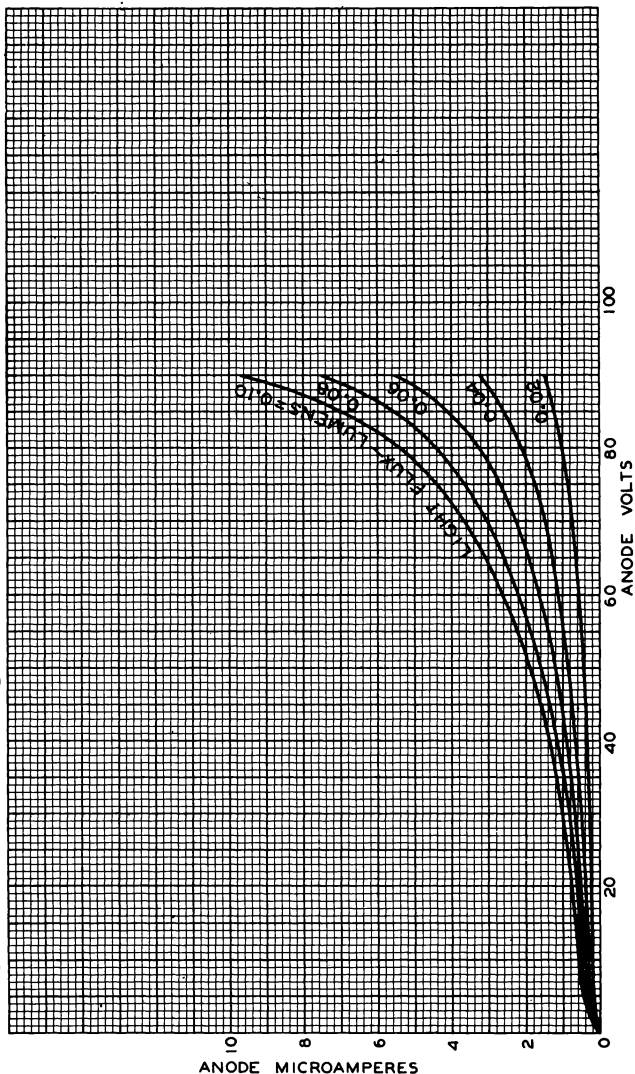
→ Indicates a change.



928

928

AVERAGE ANODE CHARACTERISTICS



JAN. 16, 1940

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6117



929

929

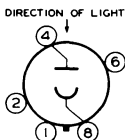
VACUUM PHOTOTUBE

WITH S-4 RESPONSE

DATA**General:**

Spectral Response	S-4
Wavelength of Maximum Response.	4000 $\pm$ 500 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	13/16"
Minimum Projected Width*.	5/8"
Direct Interelectrode Capacitance	2.6 μ mf
Maximum Overall Length.	3-1/16"
Maximum Seated Length	2-1/2"
Seated Length to Center of Cathode.	1-5/8" $\pm$ 3/32"
Maximum Diameter.	1-9/32"
Bulb.	T-9
Mounting Position	Any
Base.	Intermediate-Shell Octal 5-Pin
Basing Designation for BOTTOM VIEW.	3J

Pin 1 - No
 Connection
Pin 2 - No
 Connection



Pin 4 - Anode
Pin 6 - No
 Connection
Pin 8 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max.	volts
PEAK CATHODE CURRENT.	20 max.	μ amp
PEAK CATHODE-CURRENT DENSITY.	100 max. μ amp/sq. in.	
AVERAGE CATHODE CURRENT ^o	5 max.	μ amp
AMBIENT TEMPERATURE	75 max.	$^{\circ}$ C

Characteristics:

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>
Dark Current at 250 Volts	-	-	0.0125 . . . μ amp
Sensitivity:			
At 4000 Angstroms	-	0.042	- μ amp/ μ watt
Luminous.	25	45	70 μ amp/lumen

* on plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum.

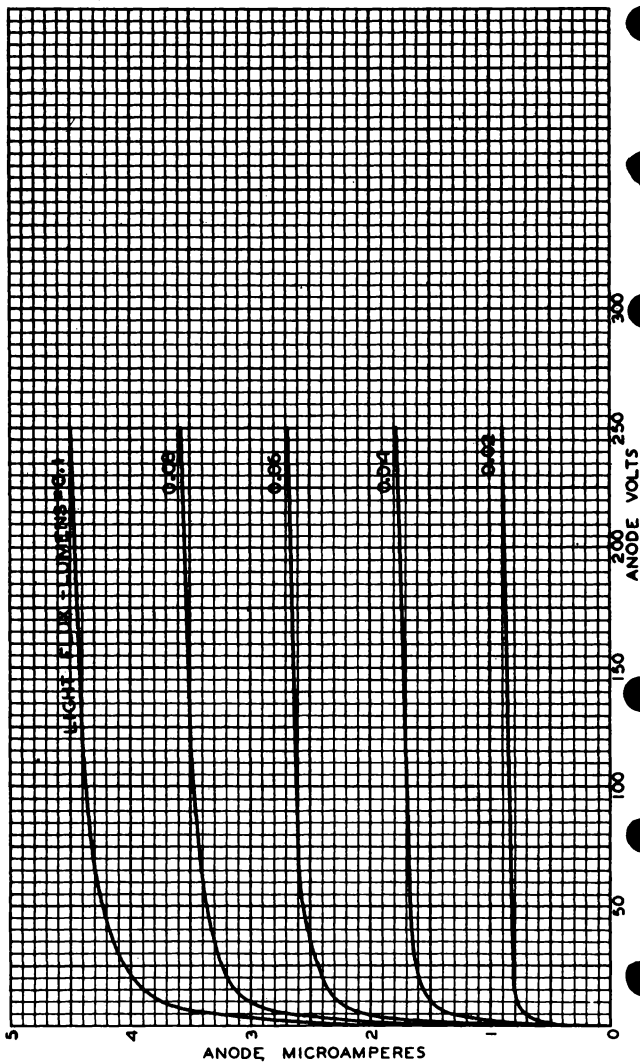
OUTLINE DIMENSIONS for Type 929
are the same as those for Type 5581

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the beginning of this Section

←Indicates a change.



AVERAGE ANODE CHARACTERISTICS





930

GAS PHOTOTUBE

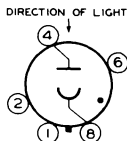
WITH S-1 RESPONSE

930

DATA**General:**

Spectral Response S-1
 Wavelength of Maximum Response. 8000 $\pm$ 1000 Angstroms ←
 Cathode:
 Shape Semi-Cylindrical
 Minimum Projected Length* 13/16"
 Minimum Projected Width* 5/8"
 Direct Interelectrode Capacitance 2.4 μ f ←
 Maximum Overall Length. 3-1/16"
 Maximum Seated Length 2-1/2"
 Seated Length to Center of Cathode. 1-5/8" $\pm$ 3/32"
 Maximum Diameter. 1-9/32"
 Bulb. T-9
 Mounting Position Any
 Base. Intermediate-Shell Octal 5-Pin
 Basing Designation for BOTTOM VIEW. 3J1

Pin 1 - No
 Connection
 Pin 2 - No
 Connection



Pin 4 - Anode
 Pin 6 - No
 Connection
 Pin 8 - Cathode

Maximum Ratings, Absolute Values:—

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 90 max. . . . volts ←
 PEAK CATHODE CURRENT. 10 max. . . . μ amp ←
 PEAK CATHODE-CURRENT DENSITY. 100 max. μ amp/sq. in. ←
 AVERAGE CATHODE CURRENT^o. 3 max. . . . μ amp ←
 AMBIENT TEMPERATURE 100 max. . . . °C

Characteristics:

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>
Dark Current at 90 Volts	—	—	0.1 . . . μ amp
Sensitivity:			
At 8000 Angstroms . . .	—	0.0135	— μ amp/ μ watt
Luminous:			
At 0 Cycles	75	135	205 μ amp/lumen ←
At 5000 Cycles . . .	—	111	— μ amp/lumen
At 10000 Cycles . . .	—	101	— μ amp/lumen
Gas Amplification Factor.	—	—	10

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

←Indicates a change.

AUGUST 15, 1947

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

930



930

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

→ For dc currents {	above 3 μ amp . . .	0.1 . . .	megohm
	below 3 μ amp . . .	No Minimum	

With anode-supply voltage of 90 volts:

For dc currents {	above 2 μ amp . . .	2.5 . . .	megohms
	below 2 μ amp . . .	1 . . .	megohm

OUTLINE DIMENSIONS for Type 930
are the same as those for Type 5581

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and

FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes

are shown at the beginning of this Section

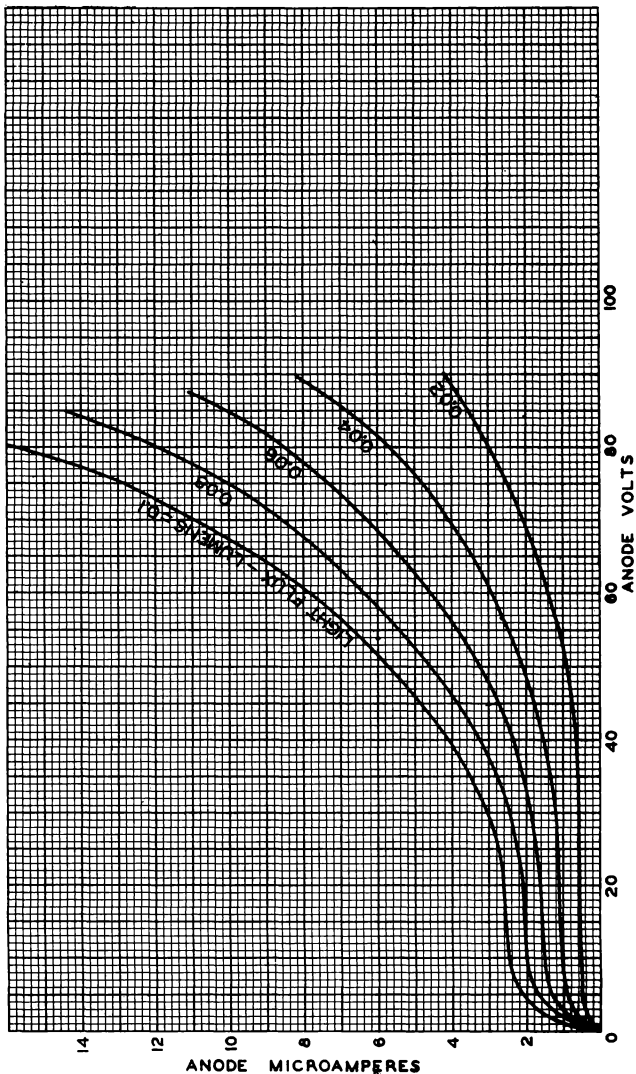
→ indicates a change.



930

930

AVERAGE ANODE CHARACTERISTICS



AUG. 4, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-4806RI



931-A MULTIPLIER PHOTOTUBE

931-A

9-STAGE TYPE WITH S-4 RESPONSE

DATA

General:

Spectral Response. S-4
Wavelength of Maximum Response 4000 $\pm$ 500 angstroms
Cathode:
Minimum projected length* 15/16"
Minimum projected width* 5/16"
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.9 4.4 μf
Anode to all other electrodes. 6 μf
Maximum Overall Length 3-11/16"
Maximum Seated Length. 3-1/8"
Length from Base Seat to Center
of Useful Cathode Area 1-15/16" $\pm$ 3/32"
Maximum Diameter 1-5/16"
Mounting Position. Any
Weight (Approx.) 1.6 oz
Bulb T-9
Base Small-Shell Submagnal 11-Pin (JETEC No.B11-88),
Non-hygroscopic

Basing Designation for BOTTOM VIEW 11K

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6



Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9
Pin 10 - Anode
Pin 11 - Cathode

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 1250 max. volts
SUPPLY VOLTAGE BETWEEN DYNODE No.9
AND ANODE (DC or Peak AC). 250 max. volts
AVERAGE ANODE CURRENT* 1 max. ma
AMBIENT TEMPERATURE. 75 max. $^{\circ}\text{C}$

Characteristic Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No.1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No.9 and anode

With E = 1000 volts (except as noted)

Min. Median Max.

Sensitivity:

Radiant, at 4000
angstroms - 24000 - $\mu\text{amp}/\mu\text{watt}$

* On plane perpendicular to the indicated direction of incident light.
● Averaged over any interval of 30 seconds maximum.

← Indicates a change.

SEPT. 1, 1955

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

	Min.	Median	Max.	
Cathode radiant, at 4000 angstroms. . .	-	0.03	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: $\bullet$				
At 0 cps.	4.5	24	300	amp/lumen
At 100 Mc.	-	23	-	amp/lumen
Cathode luminous Δ . .	-	30	-	$\mu\text{amp}/\text{lumen}$
Current Amplification .	-	800,000	-	
Equivalent Anode-Dark- Current Input $\blacksquare$	-	-	2.5×10^{-9}	lumen
Equivalent Noise Input Δ	-	9.5×10^{-13}	-	lumen

With $E = 750$ volts (except as noted)

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4000 angstroms.	-	3300	-	$\mu\text{amp}/\mu\text{watt}$
Cathode radiant, at 4000 angstroms. . .	-	0.03	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: $\bullet$				
At 0 cps.	-	3.3	-	amp/lumen
Cathode luminous Δ . .	-	30	-	$\mu\text{amp}/\text{lumen}$
Current Amplification .	-	110,000	-	

$\bullet$ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K . A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

Δ For conditions the same as shown under ($\bullet$) except that the value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected together as anode.

$\blacksquare$ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

Δ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

$\star$ Under the following conditions: Supply voltage (E) is 1000 volts, external shield operated at -1000 volts with respect to anode, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source at color temperature of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 931-A is dependent on the magnitude of the anode current and its duration. When the 931-A is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 931-A usually recovers a substantial percentage of such loss in sensitivity.



931-A

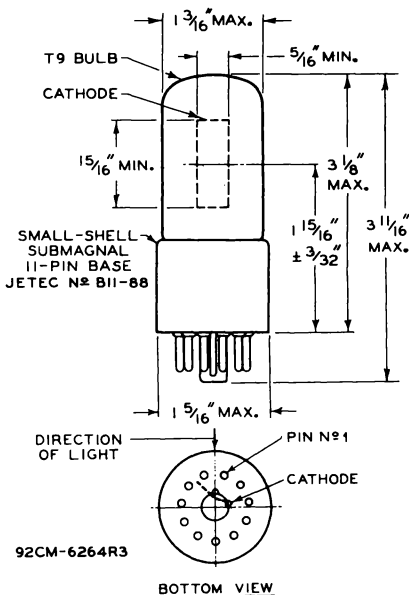
931-A

MULTIPLIER PHOTOTUBE

The use of an average anode current well below the maximum rated value of 1.0 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes, and the tube should be given a warm-up period of about 1/2 hour under load conditions.

Electrostatic and/or magnetic shielding of the 931-A may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section



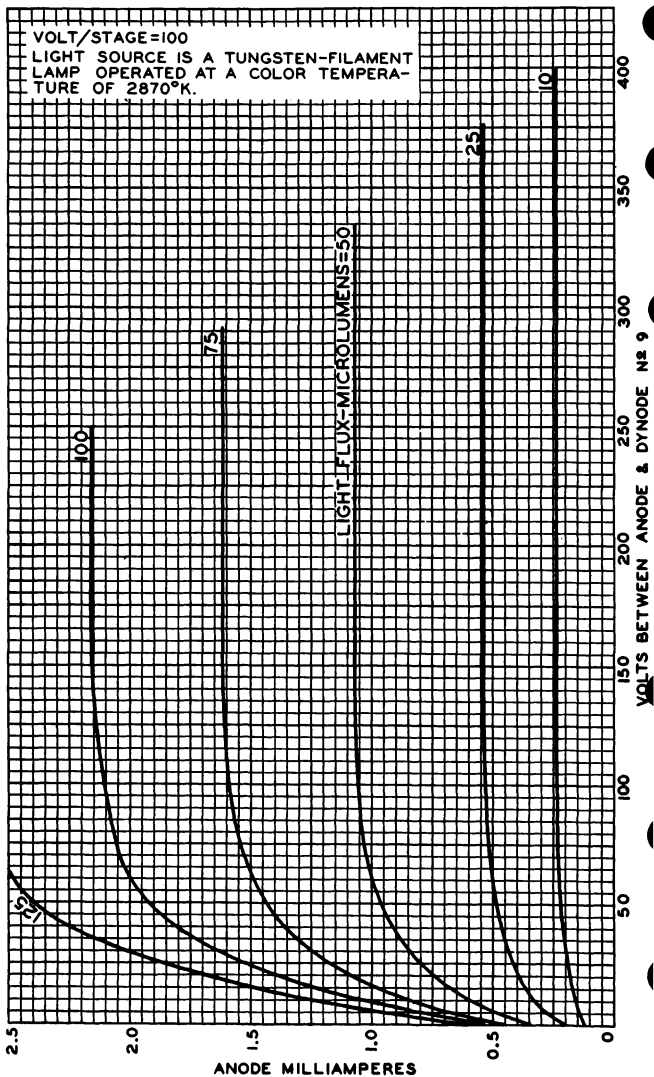
⊥ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

931-A



931-A

AVERAGE ANODE CHARACTERISTICS



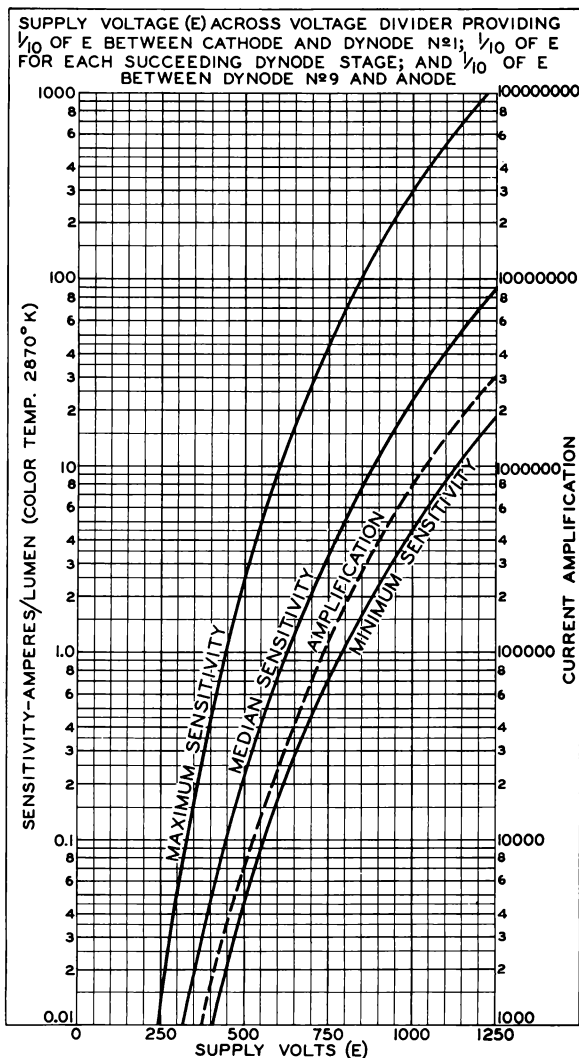
JULY 8, 1955



931-A

931-A

AVERAGE CHARACTERISTICS



JULY 8, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

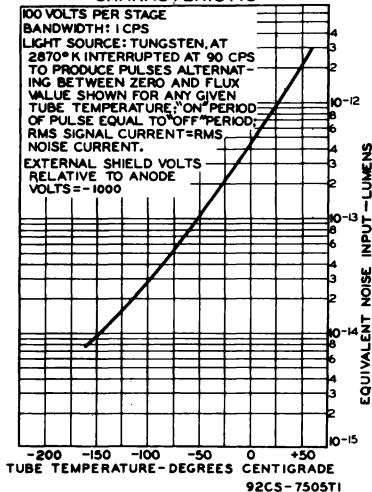
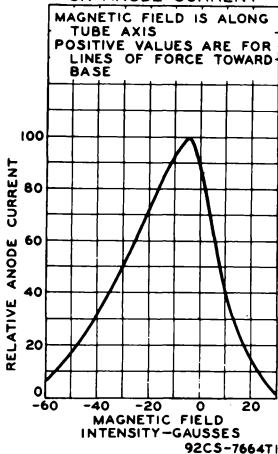
92CL-6459R3

931-A



931-A

CHARACTERISTIC CURVES

EQUIVALENT-NOISE-INPUT
CHARACTERISTICEFFECT OF MAGNETIC FIELD
ON ANODE CURRENT

SEPT. 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7505T1
-7664T1

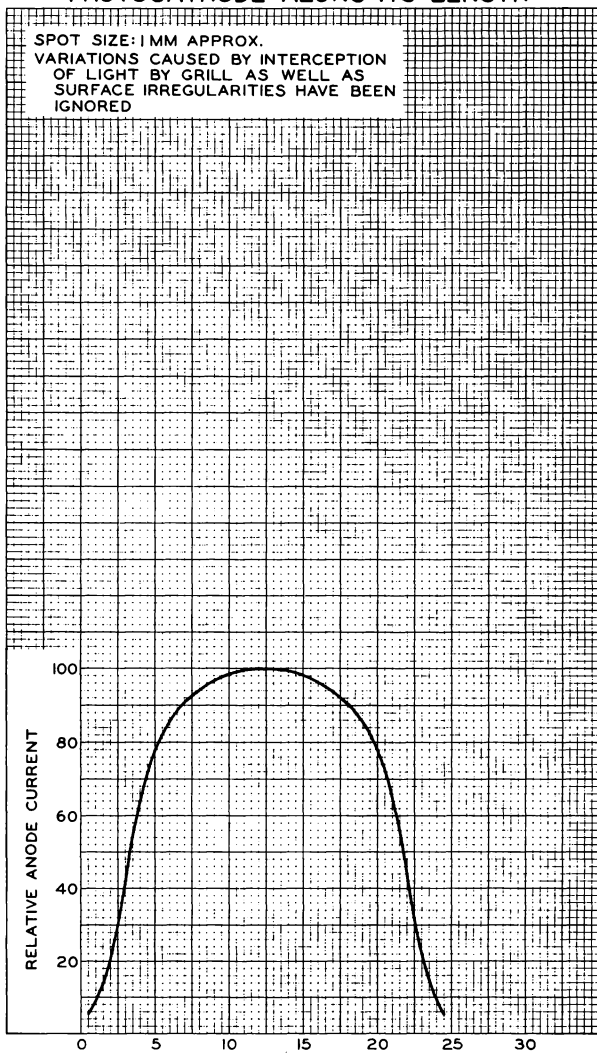


931-A

931-A

VARIATION IN SENSITIVITY OF PHOTOCATHODE ALONG ITS LENGTH

SPOT SIZE: 1MM APPROX.
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



MAR. 18, 1954

TUBE DIVISION

92CM-7663R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

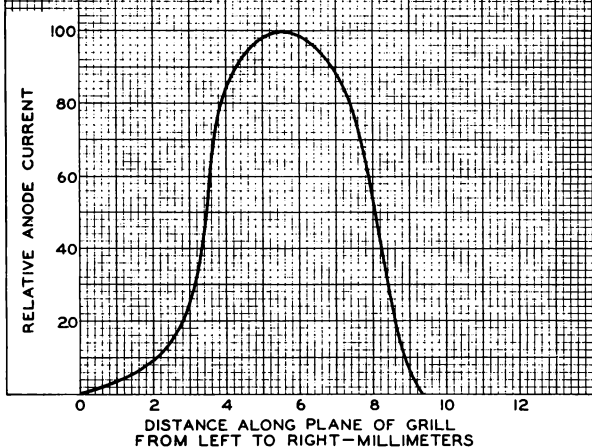
931-A



931-A

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL

SPOT SIZE: 1MM APPROX.
GRILL TOWARD OBSERVER, BASE DOWN
CATHODE WIDTH PROJECTED NORMAL
TO PLANE OF GRILL
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



MAR. 18, 1954

TUBE DIVISION

92CM-7667R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



934

934

VACUUM PHOTOTUBE

WITH S-4 RESPONSE

DATA

General:

Spectral Response S-4
 Wavelength of Maximum Response 4000 ± 500 angstroms
 Cathode:

Shape Semi-Cylindrical
 Minimum Projected Length* $11/16"$
 Minimum Projected Width* $7/16"$

Direct Interelectrode Capacitance $1.5 \mu\text{mf}$

Maximum Overall Length $2-13/32"$ ←

Maximum Seated Length $1-15/16"$ ←

Seated Length to Center of Cathode $1-1/4" \pm 3/32"$

Maximum Diameter $0.669"$ ←

Bulb T-5-1/4 ←

Mounting Position Any

Base Small-Shell Peewee 3-Pin

Basing Designation for BOTTOM VIEW 2F1

Pin 1—No
 Connection

DIRECTION
 OF LIGHT



Pin 2—Anode
 Pin 3—Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max. volts
PEAK CATHODE CURRENT	12 max. μamp
PEAK CATHODE-CURRENT DENSITY	100 max. $\mu\text{amp/sq. in.}$
AVERAGE CATHODE CURRENT*	4 max. μamp
AMBIENT TEMPERATURE	75 max. $^{\circ}\text{C}$

Characteristics:

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
DC Dark Current [□]	—	—	0.005	. . . μamp
Sensitivity:				
At 4000 angstroms	—	0.028	—	$\mu\text{amp}/\mu\text{watt}$
Luminous	15	30	70	$\mu\text{amp}/\text{lumen}$

* On plane perpendicular to indicated direction of incident light.

● Averaged over any interval of 30 seconds maximum.

□ At 25°C and 250 volts.

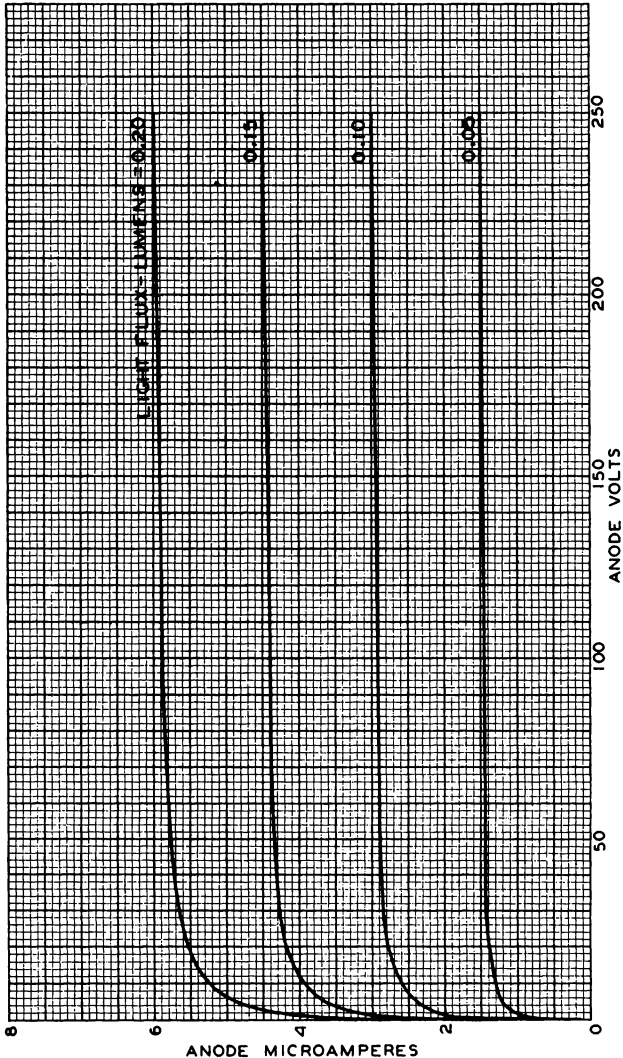
OUTLINE DIMENSIONS for Type 934
 are the same as those for Type 927

SPECTRAL-SENSITIVITY CHARACTERISTIC
 of Phototube having S-4 Response
 is shown at the front of this Section

← Indicates a change.



AVERAGE ANODE CHARACTERISTICS





935

935

VACUUM PHOTOTUBE

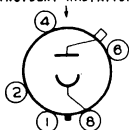
WITH S-5 RESPONSE

DATA**General:**

Spectral Response S-5
 Wavelength of Maximum Response. 3400 ± 500 Angstroms
 Cathode:
 Shape Semi-Cylindrical
 Minimum Projected Length* $1-5/16"$
 Minimum Projected Width* $5/8"$
 Direct Interelectrode Capacitance $0.6 \mu\text{f}$
 Overall Length. $4-1/8" \pm 1/8"$
 Seated Length $3-9/16" \pm 1/8"$
 Seated Length to Center of Cathode $2" \pm 1/16"$
 Maximum Diameter. $1-9/32"$
 Bulb. T-9
 Mounting Position Any
 Cap Skirted Miniature
 Base. Intermediate-Shell Octal 5-Pin

BOTTOM VIEW
 DIRECTION OF
 INCIDENT RADIATION

Pin 1 - No
 Connection
 Pin 2 - No
 Connection
 Pin 4 - No
 Connection



Pin 6 - No
 Connection
 Pin 8 - Cathode
 Cap - Anode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max. volts
PEAK CATHODE CURRENT.	30 max. μamp
PEAK CATHODE-CURRENT DENSITY.	100 max. $\mu\text{amp/sq. in.}$
AVERAGE CATHODE CURRENT ^o	10 max. μamp
AMBIENT TEMPERATURE	75 max. $^{\circ}\text{C}$

Characteristics:

	<u>Min.</u>	<u>Avg.</u>	<u>Max.</u>	
Dark Current at 250 Volts	-	-	0.0005	. . . μamp
Sensitivity:				
At 3400 Angstroms	-	0.032	-	$\mu\text{amp}/\mu\text{watt}$ ←
Luminous [▲]	18	35	70	$\mu\text{amp}/\text{lumen}$ ←

* On plane perpendicular to indicated direction of incident radiation.

^o Averaged over any interval of 30 seconds maximum.

[▲] Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at the front of this section.

SPECTRAL-SENSITIVITY CHARACTERISTIC
 of Phototube having S-5 Response
 is shown at the beginning of this Section

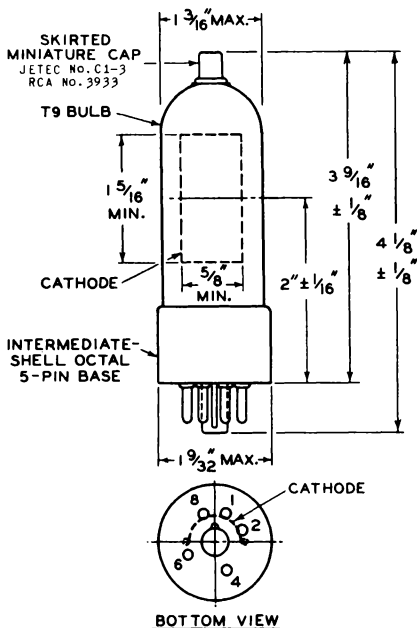
← Indicates a change.

935



935

VACUUM PHOTOTUBE



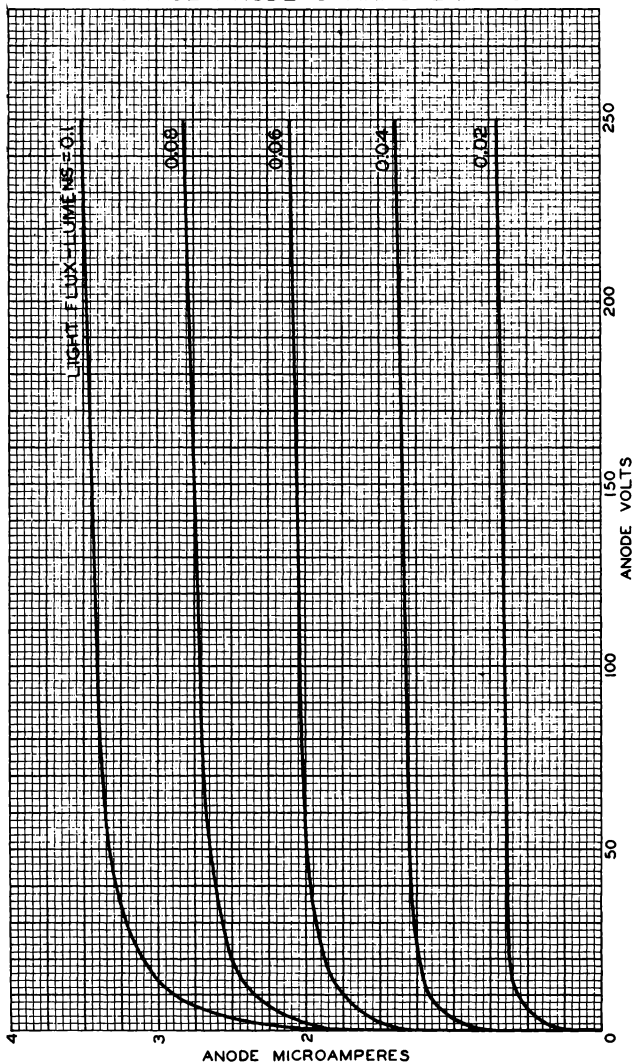
92CM-6411R4



935

935

AVERAGE ANODE CHARACTERISTICS



APRIL 20, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6478RI



2020

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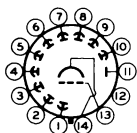
MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE WITH
1-1/2"-DIAMETER, CIRCULAR, LOW-RESISTIVITY,
SEMITRANSSPARENT PHOTOCATHODE AND S-11 RESPONSE
SHORT TIME-RESOLUTION CAPABILITY

DATA**General:**

Spectral Response. S-11
Wavelength of Maximum Response 4400 ± 500 angstroms
Cathode, Semitransparent, Low-Resistivity:
Shape. Circular with conductive grating
Window:
Area including grating 1.8 sq. in.
Minimum diameter 1.5 in.
Index of refraction. 1.51
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.10. 4.4 $\mu\mu\text{f}$
Anode to all other electrodes. 7 $\mu\mu\text{f}$
Maximum Overall Length 5-13/16"
Seated Length. 4-7/8" $\pm$ 3/16"
Maximum Diameter 2-5/16"
Operating Position Any
Weight (Approx.) 5 oz
Bulb T16
Base Medium-Shell Diheptal 14-Pin
(JEDEC Group 5, No.B14-38),
Non-hygroscopic
Basing Designation for BOTTOM VIEW 14AA

Pin 1-Dynode No.1
Pin 2-Dynode No.2
Pin 3-Dynode No.3
Pin 4-Dynode No.4
Pin 5-Dynode No.5
Pin 6-Dynode No.6
Pin 7-Dynode No.7
Pin 8-Dynode No.8
Pin 9-Dynode No.9



DIRECTION OF LIGHTS
INTO END OF BULB

Pin 10-Dynode No.10
Pin 11-Anode
Pin 12-Internal
Connection—
Do Not Use
Pin 13-Focusing
Electrode
Pin 14-Photo-
cathode

Maximum Ratings, Absolute Values:

SUPPLY VOLTAGE BETWEEN ANODE AND
CATHODE (DC or Peak AC). 1500 max. volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10
AND ANODE (DC or Peak AC). 250 max. volts
DYNODE-No.1 SUPPLY VOLTAGE
(DC or Peak AC). 400 max. volts
FOCUSING-ELECTRODE VOLTAGE
(DC or Peak AC). 400 max. volts
AVERAGE ANODE CURRENT* 2 max. ma
CATHODE ILLUMINATION 0.1 max. $\frac{\text{lumen}}{\text{sq. in.}}$
AMBIENT TEMPERATURE. 75 max. $^{\circ}\text{C}$

* , $\frac{\text{sq. in.}}{\text{sq. in.}}$: See next page.



MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing $1/6$ of E between cathode and dynode No. 1; $1/12$ of E for each succeeding dynode stage; and $1/12$ of E between dynode No. 10 and anode

With $E = 1250$ volts (Except as noted) and focusing electrode* connected to dynode No. 1 at socket

Min. Median Max.

Sensitivity:

Radiant, at 4400 angstroms. . . .	-	4800	-	$\mu\text{a}/\mu\text{W}$
Cathode radiant, at 4400 angstroms .	-	0.04	-	$\mu\text{a}/\mu\text{W}$
Luminous:●				
At 0 cps	2.5	6	75	amp/lumen
With dynode No.10 as output electrode■ . .	-	3.6	-	amp/lumen
Cathode luminous: With tungsten light source▲.	30	50	-	$\mu\text{a}/\text{lumen}$
With blue light source®	0.03	-	-	μa

Current

Amplification, . . .	-	120000	-
----------------------	---	--------	---

Equivalent Anode—

Dark-Current				
Input $\Phi_{\square}$	-	2.5×10^{-10}	2.25×10^{-9}	lumen

Equivalent Noise

Input*	7×10^{-12}	lumen
--------	---------------------	-------

With $E = 1500$ volts (Except as noted) and focusing electrode* connected to dynode No.1 at socket

Min.	Median	Max.
------	--------	------

Sensitivity:

Radiant, at 4400 angstroms. . . .	-	22400	-	$\mu\text{a}/\mu\text{m}$
Cathode radiant, at 4400 angstroms .	-	0.04	-	$\mu\text{a}/\mu\text{m}$
Luminous:●				
At 0 cps	12	28	315	amp/lumen
With dynode No.10 as output electrode■ . .	-	17	-	amp/lumen
Cathode luminous: With tungsten light source▲.	30	50	-	$\mu\text{a}/\text{lumen}$
With blue light source◆	0.03	-	-	μa

Current Amplification. — 5
●, §, *, ♀, ■, ▲, ⊙, ◆, ⊕, □, ☆: See next page.



2020

2020

MULTIPLIER PHOTOTUBE

- Averaged over any interval of 30 seconds maximum.
- § Above this value of cathode illumination, serious loss in linearity between light input and anode current will be caused by the resistivity of the cathode. For continuous light input of 0.1 lumen from tungsten light source at 2870° K incident on cathode area having diameter of $1\frac{1}{4} \pm \frac{1}{8}$ ", and with dynode-No.1 voltage of 200 volts, the loss in linearity will not exceed 30 per cent depending on the magnitude of the cathode current. At 0.1 lumen, the corresponding continuous cathode current is approximately 5 microamperes, regardless of the spectral distribution of the exciting illumination.
- * In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.
- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.
- An output current of reversed polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as a collector. The value of sensitivity at dynode No.10 is approximately 60 per cent of that when the anode is the output electrode. Specifically, the sensitivity measured at dynode No.10 is equal to $(1 - 1/g)$ times the sensitivity measured at the anode, where "g" is the gain of the dynode-No.10 stage.
- ▲ For conditions the same as shown under (•) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.
- Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux on the filament is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.
- ◆ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870° K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870° K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.
- Measured at a tube temperature of 25° C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission may be reduced by the use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.
- ★ Under the following conditions: Supply voltage (E) is 1250 volts, 25°-C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870° K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 2020 depends on the magnitude and duration of the anode current. When the 2020 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 2020 usually recovers a substantial percentage of such loss in sensitivity.

2020



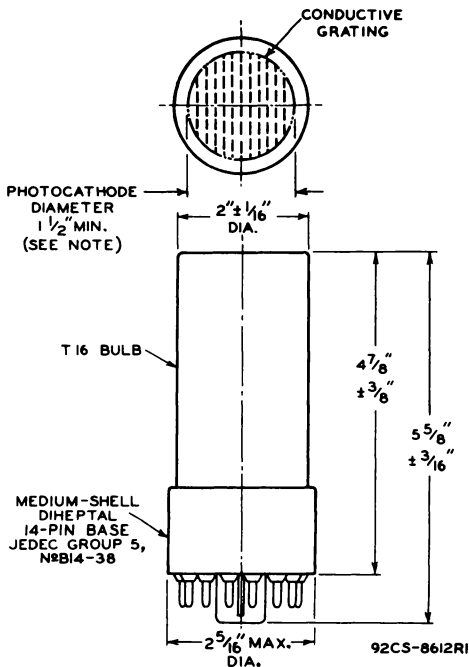
2020

MULTIPLIER PHOTOTUBE

Operation at an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or magnetic shielding of the 2020 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at front of this Section



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN $1\frac{1}{2}"$ DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

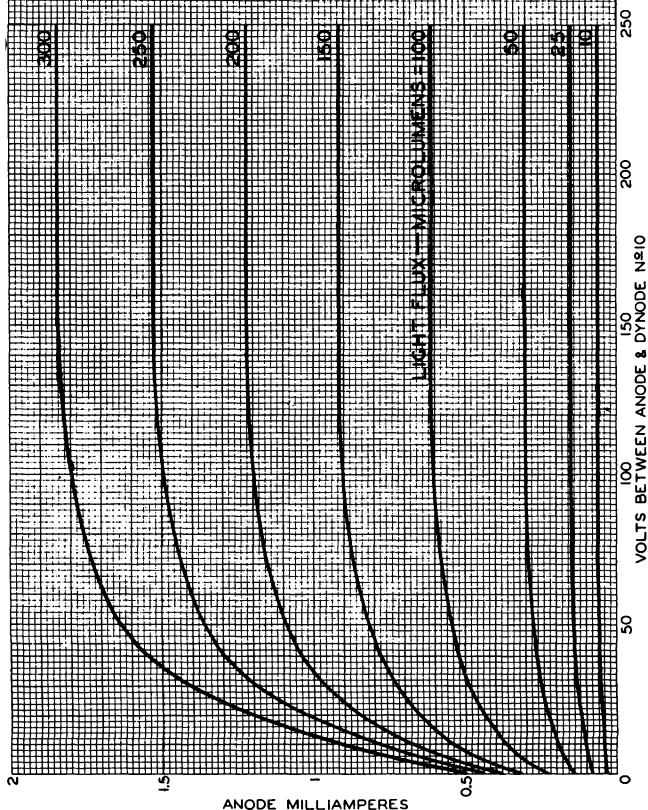


2020

2020

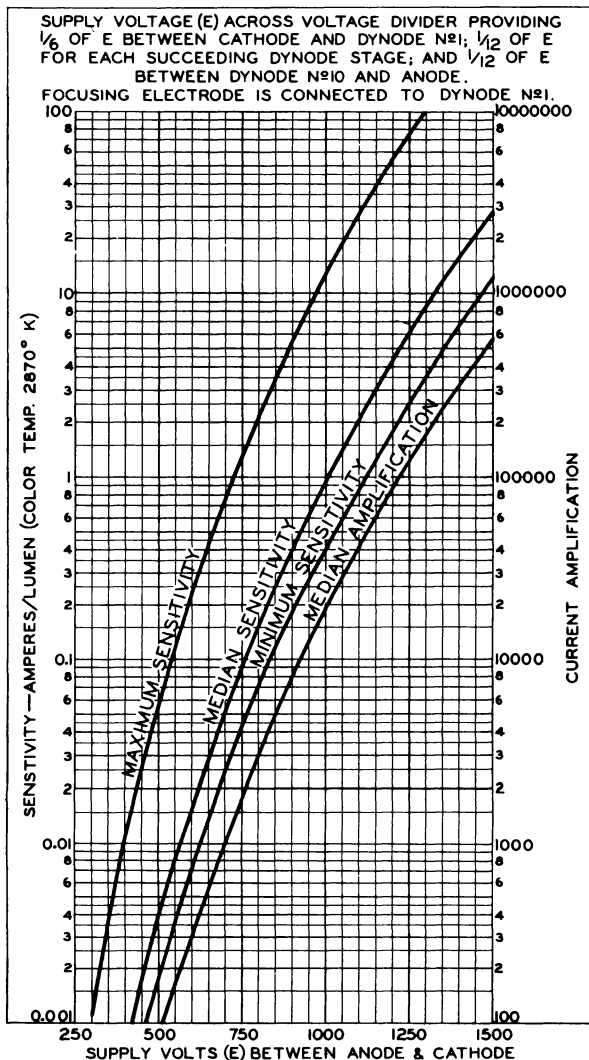
AVERAGE ANODE CHARACTERISTICS

DYNODE-N₂1-TO-CATHODE VOLTS = 200
EACH-SUCCESSING-DYNODE-STAGE VOLTS = 100
FOCUSING ELECTRODE CONNECTED TO DYNODE N₂1.
LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP
OPERATED AT A COLOR TEMPERATURE OF 2870° K.





CHARACTERISTICS

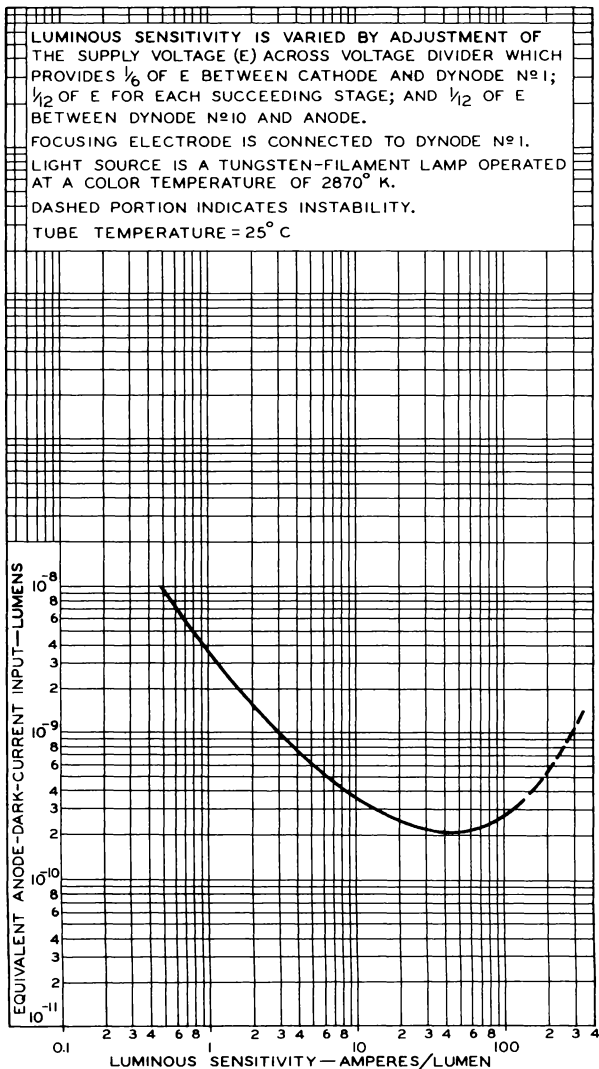




2020

2020

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



2020



2020

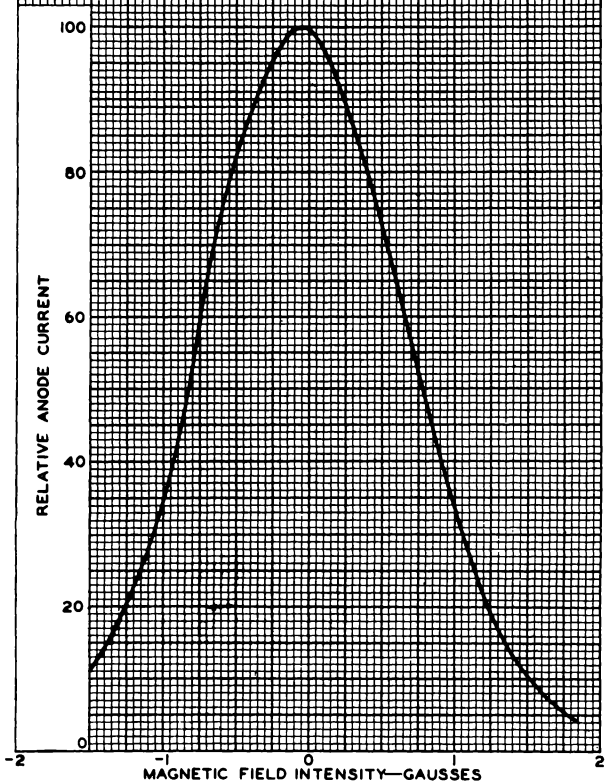
EFFECT OF MAGNETIC FIELD ON ANODE CURRENT

MAGNETIC FIELD IS PARALLEL TO DYNODE-CAGE AXIS.
POSITIVE VALUES ARE FOR LINES OF FORCE FROM LEFT
TO RIGHT WITH BASE DOWN AND BASE KEY TOWARD
OBSERVER.

DYNODE-N^o1-TO-CATHODE VOLTS=150

EACH-SUCCEEDING-STAGE VOLTS=100

FOCUSING ELECTRODE IS CONNECTED TO DYNODE N^o1.





5581

GAS PHOTOTUBE

BLUE-SENSITIVE

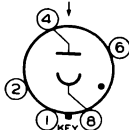
5581

DATA

General:

Spectral Response.	S-4
Wavelength of Maximum Response	4000 $\pm$ 500 Angstroms
Cathode:	
Shape.	Semi-Cylindrical
Minimum Projected Length*.	13/16"
Minimum Projected Width*.	5/8"
Direct Interelectrode Capacitance.	2.6 μ f
Maximum Overall Length.	3-1/16"
Maximum Seated Length.	2-1/2"
Seated Length to Center of Cathode	1-5/8" $\pm$ 3/32"
Maximum Diameter	1-5/16"
Bulb	T-9
Mounting Position	Any
Base	Intermediate-Shell Octal 5-Pin

BOTTOM VIEW
DIRECTION OF LIGHT



Pin 1—No Connection
Pin 2—No Connection
Pin 4—Anode

Pin 6—No Connection
Pin 8—Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max. . .	volts
PEAK CATHODE CURRENT	10 max. . .	μ amp
PEAK CATHODE-CURRENT DENSITY	100 max. μ amp/sq. in.	
AVERAGE CATHODE CURRENT ^o	3 max. . .	μ amp
AMBIENT TEMPERATURE.	75 max. . .	$^{\circ}$ C

Characteristics:

	<u>Min.</u>	<u>Au.</u>	<u>Max.</u>	
Dark Current at 90 Volts	—	—	0.050	μ amp
Sensitivity:				
At 4000 Angstroms.	—	0.125	—	μ amp/ μ watt
Luminous:				
At 0 Cycles.	75	135	205	μ amp/lumen
At 5000 Cycles	—	124	—	μ amp/lumen
At 10000 Cycles.	—	108	—	μ amp/lumen
Gas Amplification Factor	—	—	5.5	

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less

For dc currents {	above 3 μ amp . . .	0.1 . . .	megohm
	below 3 μ amp . . .	No Minimum	

With anode-supply voltage of 100 volts

For dc currents {	above 1 μ amp . . .	2.5 . . .	megohms
	below 1 μ amp . . .	0.1 . . .	megohm

*₀: See next page.

APRIL 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5581

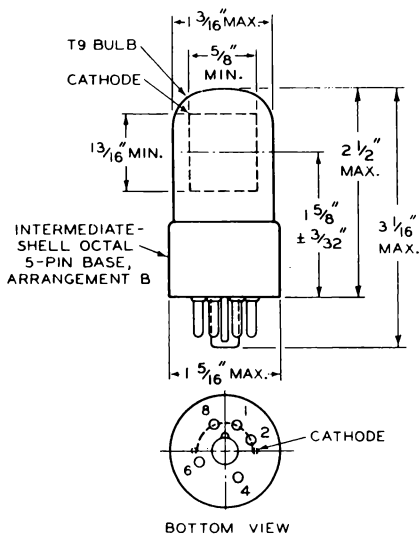


5581

GAS PHOTOTUBE

- * On plane perpendicular to indicated direction of incident light.
 O Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

SPECTRAL-SENSITIVITY CHARACTERISTIC
 and
 FREQUENCY-RESPONSE CHARACTERISTIC
 of Gas Phototube having S-4 Response
 are shown at beginning of this Section



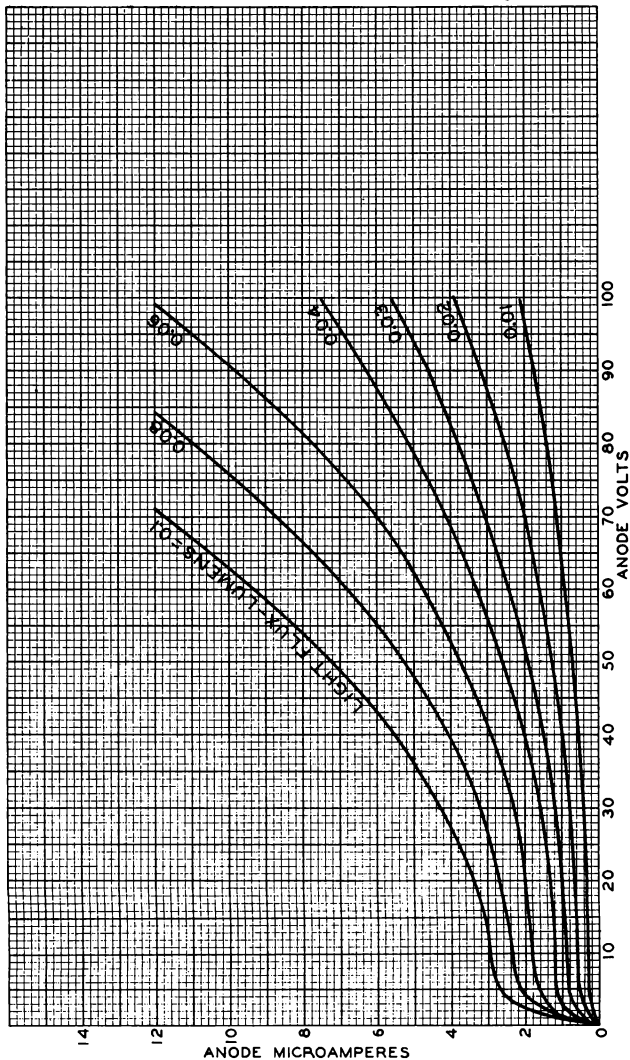
92CM-6137R2



5581

5581

AVERAGE ANODE CHARACTERISTICS





5582

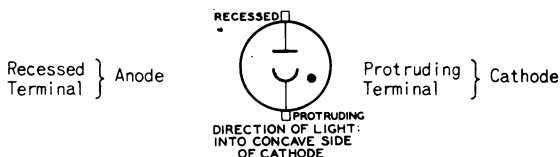
GAS PHOTOTUBE

CARTRIDGE TYPE WITH S-4 RESPONSE

5582

DATA**General:**

Spectral Response. S-4
 Wavelength of Maximum Response 4000 $\pm$ 500 Angstroms
 Cathode:
 Shape. Semi-Cylindrical
 Minimum Projected Length* 5/8"
 Minimum Projected Width* 1/2"
 Direct Interelectrode Capacitance. 1.0 μ f
 Overall Length 1-21/32" $\pm$ 1/16"
 Length, Cathode Center to plane A-A' (See Outline) 11/16" $\pm$ 1/16"
 Maximum Diameter 0.890"
 Mounting Position. Any
 Terminal Caps. See Outline

BOTTOM VIEW**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max.	.. volts
PEAK CATHODE CURRENT	10 max.	.. μ amp
PEAK CATHODE-CURRENT DENSITY	100 max.	μ amp/sq. in.
AVERAGE CATHODE CURRENT ^o	2 max.	.. μ amp
AMBIENT TEMPERATURE	75 max.	.. °C

Characteristics:

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
Dark Current at 90 Volts . .	—	—	0.050	.. μ amp
Sensitivity:				
At 4000 Angstroms.	—	0.11	—	μ amp/ μ watt
Luminous: [▲]				
At 0 Cycles.	80	120	175	μ amp/lumen ←
At 5000 Cycles	—	110	—	μ amp/lumen
At 10000 Cycles.	—	96	—	μ amp/lumen
Gas Amplification Factor . .	—	—	5.5	

Minimum Circuit Values:**DC Load Resistance:***With anode-supply voltage of 80 volts or less*

For dc currents {	above 3 μ amp	0.1	megohm
	below 3 μ amp	No Minimum	

With anode-supply voltage of 100 volts

For dc currents {	above 1 μ amp	2.5	megohms
	below 1 μ amp	0.1	megohm

* , ^o , [▲] : See next page.

← indicates a change.

JUNE 15, 1948

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

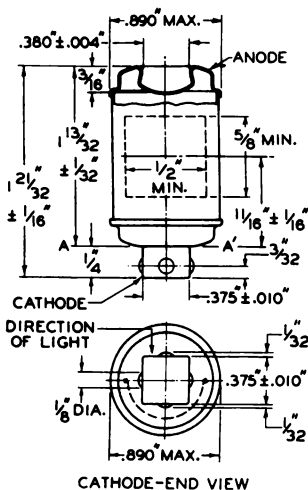


5582

GAS PHOTOTUBE

- * On plane perpendicular to indicated direction of incident light.
- Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.
- ▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at the front of this section.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section



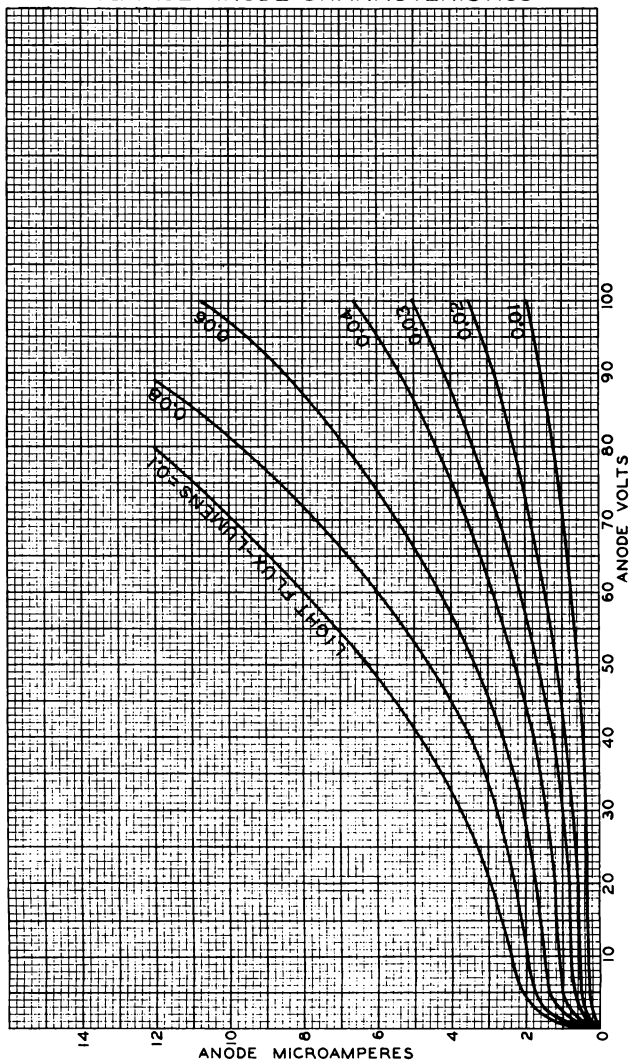
92CM-4818R2



5582

5582

AVERAGE ANODE CHARACTERISTICS



DEC. 27, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6823



5583

5583

GAS PHOTOTUBE

WITH S-4 RESPONSE

DATA**General:**

Spectral Response. S-4

Wavelength of Maximum Response 4000 $\pm$ 500 angstroms**Cathode:**

Shape. Semi-Cylindrical

Minimum Projected Length* 11/16"

Minimum Projected Width* 7/16"

Direct Interelectrode Capacitance. 2.0 μ fMaximum Overall Length 2-13/32" $\leftarrow$ Maximum Seated Length. 1-15/16" $\leftarrow$ Seated Length to Center of Cathode 1-1/4" $\pm$ 3/32" $\leftarrow$ Maximum Diameter 0.669" $\leftarrow$ Bulb T-5-1/4" $\leftarrow$

Mounting Position. Any

Base Small-Shell Peewee 3-Pin

Basing Designation for BOTTOM VIEW 2F

DIRECTION OF LIGHT

Pin 1—No
ConnectionPin 2—Anode
Pin 3—Cathode**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC or Peak AC) . . . 100 max. . . volts

PEAK CATHODE CURRENT 10 max. . . μ ampPEAK CATHODE-CURRENT DENSITY 100 max. μ amp/sq. in.AVERAGE CATHODE CURRENT^o 2 max. . . μ ampAMBIENT TEMPERATURE. 75 max. . . $^{\circ}$ C**Characteristics:**

	Min.	Av.	Max.
Dark Current at 90 Volts . .	—	—	0.050 . . μ amp

Sensitivity:At 4000 angstroms. — 0.125 — μ amp/ μ watt**Luminous:[▲]**At 0 cps 75 135 205 μ amp/lumenAt 5000 cps. — 124 — μ amp/lumenAt 10000 cps — 108 — μ amp/lumen

Gas Amplification Factor — — 5.5

Minimum Circuit Values:**DC Load Resistance:**

With anode-supply voltage of 80 volts or less

For dc currents {	above 3 μ amp . . .	0.1 megohm
	below 3 μ amp . . .	No Minimum

With anode-supply voltage of 100 volts

For dc currents {	above 1 μ amp . . .	2.5 megohms
	below 1 μ amp . . .	0.1 megohm

*, o, ▲: See next page.

 $\leftarrow$ Indicates a change.

5583



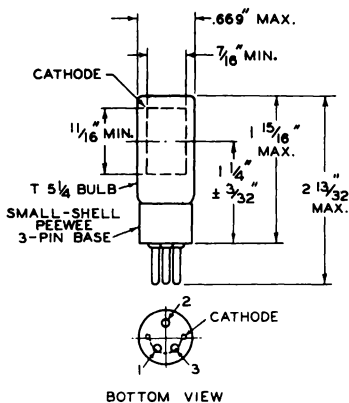
5583

GAS PHOTOTUBE

- * On plane perpendicular to indicated direction of incident light.
- Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.
- ▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at front of this Section.

SPECTRAL-SENSITIVITY CHARACTERISTIC
and
FREQUENCY-RESPONSE CHARACTERISTIC
of Gas Phototube having S-4 Response
are shown at front of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 5583 are the same
as those shown under Type 5581



92CM-6053R4

→ Indicates a change.

MAY 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6053R4



5584

5584

GAS PHOTOTUBE

BLUE SENSITIVE, TWIN TYPE

General:DATA

Spectral Response. S-4
Wavelength of Maximum Response 4000 $\pm$ 500 Angstroms
Cathode (Each):
 Shape. Quarter-Cylindrical
 Minimum Projected Length* 1-3/16"
 Minimum Projected Width* 1/4"
Direct Interelectrode Capacitances:
 Cathode to Anode $\blacklozenge$ 1.6 . . $\mu\mu\text{f}$
 Cathode to Cathode $\blacksquare$ 1.8 . . $\mu\mu\text{f}$
 Anode to Anode $\bullet$ 0.44 . . $\mu\mu\text{f}$
Maximum Overall Length 4"
Maximum Seated Length 3-3/8"
Seated Length to Center of Cathode 2-1/8" $\pm$ 3/32"
Maximum Diameter 1-3/16"
Bulb T-9
Mounting Position Any
Base Small-Shell Small 4-Pin
 Basing Designation for BOTTOM VIEW 4BG

Pin 1 - Cathode,
Unit No.2
Pin 2 - Anode,
Unit No.2



DIRECTION OF LIGHT

Pin 3 - Anode,
Unit No.1
Pin 4 - Cathode,
Unit No.1

Maximum Ratings, Absolute Values (Each Unit):

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max.	. . volts
PEAK CATHODE CURRENT	10 max.	. . μamp
PEAK CATHODE-CURRENT DENSITY	50 max.	$\mu\text{amp/sq. in.}$
AVERAGE CATHODE CURRENT ^o	2 max.	. . μamp
AMBIENT TEMPERATURE	75 max.	 $^{\circ}\text{C}$

Characteristics (Each Unit):

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
Dark Current at 90 Volts . .	—	—	0.050	 μamp
Sensitivity:				
At 4000 Angstroms.	—	0.11	—	$\mu\text{amp}/\mu\text{watt}$
Luminous:				
At 0 Cycles.	80	120	175	$\mu\text{amp}/\text{lumen}^*$
At 5000 Cycles.	—	110	—	$\mu\text{amp}/\text{lumen}$
At 10000 Cycles.	—	96	—	$\mu\text{amp}/\text{lumen}$
Gas Amplification Factor . .	—	—	5.5	

Minimum Circuit Values (Each Unit):**DC Load Resistance:**

With anode-supply voltage of 80 volts or less

For dc currents $\left\{ \begin{array}{l} \text{above } 3 \mu\text{amp} 0.1 \text{megohm} \\ \text{below } 3 \mu\text{amp} \text{No Minimum} \end{array} \right.$

* , $\blacklozenge$, $\blacksquare$, $\bullet$, ^o: See next page.

APRIL 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

5584



5584

GAS PHOTOTUBE

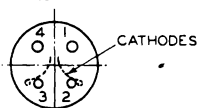
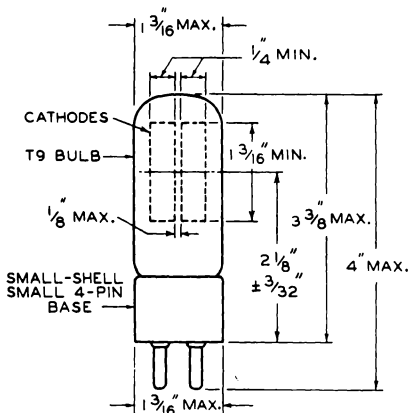
With anode-supply voltage of 100 volts

For dc currents { above 1 μ amp . . . 2.5 megohms
below 1 μ amp . . . 0.1 megohm

- * On plane perpendicular to indicated direction of incident light.
- ◆ Each unit, with other unit grounded.
- Anodes grounded.
- Cathodes grounded.
- Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

SPECTRAL-SENSITIVITY CHARACTERISTIC
and
FREQUENCY-RESPONSE CHARACTERISTIC
of Gas Phototube having S-4 Response
are shown at beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 5584 are the same
as those shown under Type 5582



BOTTOM VIEW

92CM-4561R3

APRIL 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-4561R3



5652

VACUUM PHOTOTUBE

COMPOSITE ANODE-CATHODE TYPE WITH S-4 RESPONSE

5652

DATA

General:

Spectral Response. S-4
 Wavelength of Maximum Response 4000 $\pm$ 500 Angstroms

Cathode:

Shape. Flat
 Minimum Projected Length* 1/4"
 Minimum Projected Width* 19/32"
 Direct Interelectrode Capacitance (C₁)[▲]. 1 μ f
 Balancing Capacitance (C₂)[□]. 1 μ f
 Capacitance Difference Between

C₁ and C₂ Not more than 0.3 μ f

Maximum Overall Length 2-7/8"

Maximum Seated Length. 2-5/16"

Seated Length to Center of Cathode 1-5/8" $\pm$ 3/32"

Maximum Diameter 1-9/32"

Bulb T-9

Mounting Position. Any

Base Intermediate-Shell Octal

5-Pin, Non-hygroscopic

Basing Designation for BOTTOM VIEW 2AB

Pin 1: No

Connection

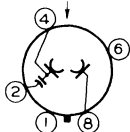
Pin 2: Balancing

Capacitance

Pin 4: Cathode or

Anode

DIRECTION OF LIGHT



Pin 6: No

Connection

Pin 8: Anode or

Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 250 max. . . . volts

PEAK CATHODE CURRENT (For
 either electrode) 12 max. . . . μ amp

PEAK CATHODE-CURRENT DENSITY 100 max. μ amp/sq.in.

AVERAGE CATHODE CURRENT (For
 either electrode)[○] 4 max. . . . μ amp

AMBIENT TEMPERATURE. 75 max. . . . °C

Characteristics:

	Min.	Av.	Max.
Dark Current at 250 Volts.	—	—	0.01 μ amp

Sensitivity:

At 4000 Angstroms.	—	0.042	— μ amp/ μ watt
----------------------------	---	-------	-------------------------

Luminous	30	45	70 μ amp/lumen
--------------------	----	----	--------------------

* On plane perpendicular to indicated direction of incident light.

▲ Measured between base pins 4 and 8.

□ Measured between base pins 2 and 4.

○ Averaged over any interval of 30 seconds maximum.

OCTOBER 1, 1947

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

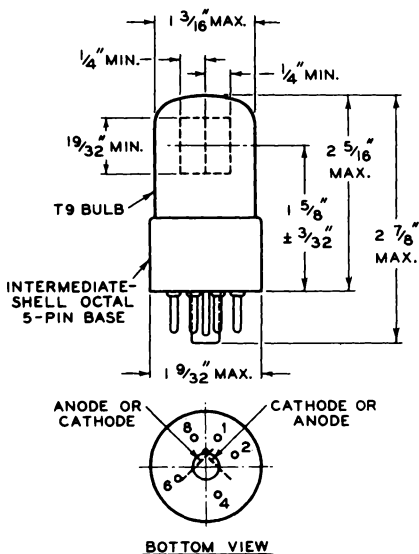
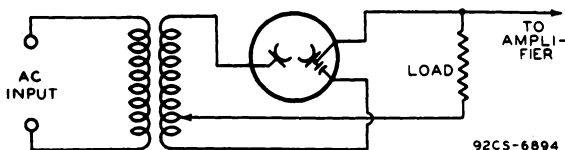


5652 VACUUM PHOTOTUBE

SPECTRAL SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the beginning of this Section

The curve shown under Type 929
is also applicable to the 5652

TYPICAL CIRCUIT



92CS - 6869



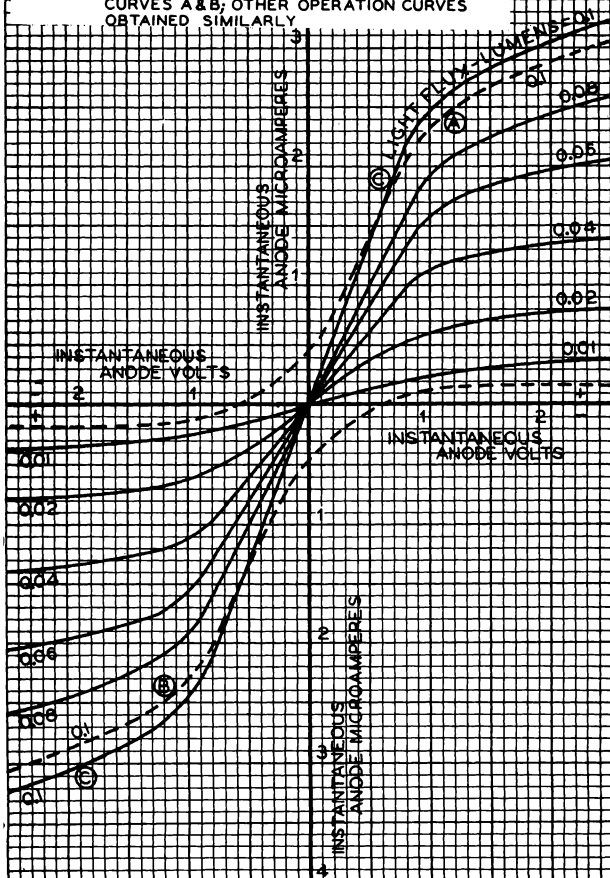
5652

5652

AVERAGE OPERATION CHARACTERISTICS WITH AC VOLTAGE APPLIED BETWEEN THE TWO ELECTRODES

ILLUMINATION: 2870°K TUNGSTEN

LOAD RESISTANCE: ZERO

DASHED CURVE (A) STATIC CHARACTERISTIC FOR ONE
ELECTRODE WITH 0.1 LUMENDASHED CURVE (B) STATIC CHARACTERISTIC FOR OTHER
ELECTRODE WITH 0.1 LUMENCURVE (C) OPERATION CURVE OBTAINED FROM STATIC
CURVES A & B; OTHER OPERATION CURVES
OBTAINED SIMILARLY



5653

VACUUM PHOTOTUBE

WITH S-4 RESPONSE

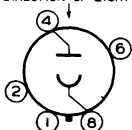
5653

DATA**General:**

Spectral Response. S-4
Wavelength of Maximum Response 4000 $\pm$ 500 Angstroms
Cathode:
Shape. Semi-Cylindrical
Minimum Projected Length*. 13/16"
Minimum Projected Width*. 5/8"
Direct Interelectrode Capacitance. 2.6 μf
Maximum Overall Length 3-1/16"
Maximum Seated Length. 2-1/2"
Seated Length to Center of Cathode 1-5/8" $\pm$ 3/32"
Maximum Diameter 1-9/32"
Bulb T-9
Mounting Position. Any
Base Intermediate-Shell Octal 5-Pin
Basing Designation for BOTTOM VIEW 3J

DIRECTION OF LIGHT

Pin 1-No
Connection
Pin 2-No
Connection



Pin 4-Anode
Pin 6-No
Connection
Pin 8-Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 250 max. . . . volts
PEAK CATHODE CURRENT 20 max. . . . μamp
PEAK CATHODE-CURRENT DENSITY 100 max. $\mu\text{amp/sq.in.}$
AVERAGE CATHODE CURRENT^o 5 max. . . . μamp
AMBIENT TEMPERATURE. 75 max. . . . $^{\circ}\text{C}$

Characteristics:

	<u>Min.</u>	<u>Avg.</u>	<u>Max.</u>	
Dark Current at 250 Volts	-	-	0.25	μamp
Sensitivity:				
At 4000 Angstroms.	-	0.042	-	$\mu\text{amp}/\mu\text{watt}$
Luminous	20	45	100	$\mu\text{amp}/\text{lumen}$

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum.

OUTLINE DIMENSIONS for Type 5653
are the same as those for Type 5581

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 5653 are the same
as those shown under Type 929

SEPT. 15, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA



5819

10-STAGE, HEAD-ON TYPE WITH
1-1/2" SEMI-TRANSPARENT CATHODE AND S-4 RESPONSE

Spectral Response	S-4	←
Wavelength of Maximum Response	4000 ± 500 angstroms	
Cathode, Semi-Transparent:		
Shape	Circular	
Window:		
Area	1.8	sq. in.
Minimum diameter	1.5	in.
Index of refraction	1.51	
Direct Interelectrode Capacitances (Approx):		←
Anode to dynode No.10	4.2	μμf
Anode to all other electrodes	6.5	μμf
Overall Length	5-5/8" ± 3/16"	
Seated Length	4-7/8" ± 3/16"	
Maximum Diameter	2-1/4"	
Mounting Position	Any	
Bulb	T-16	
Base	Medium-Shell Diheptal 14-Pin, Non-hygroscopic	
	(JETEC No.814-38)	

Pin 1 – Dynode No.1
Pin 2 – Dynode No.2
Pin 3 – Dynode No.3
Pin 4 – Dynode No.4
Pin 5 – Dynode No.5
Pin 6 – Dynode No.6
Pin 7 – Dynode No.7
Pin 8 – Dynode No.8



Pin 9 - Dynode No.9
Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - No
 Connection
Pin 13 - Internal Con.
 Do Not Use
Pin 14 - Cathode

ANODE-SUPPLY VOLTAGE (DC or Peak AC) . . .	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC) . . .	150 max.	volts
SUPPLY VOLTAGE BETWEEN CATHODE AND DYNODE No.1 (DC or Peak AC) . . .	300 max.	volts
ANODE CURRENT:		
Peak	7.5 max.	ma
Average ⁰	0.75 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

^o Averaged over any interval of 30 seconds maximum.

← indicates a change



MULTIPLIER PHOTOTUBE

→ Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode.

Min. Median Max.

With E = 1000 volts (except as noted)

Sensitivity:

Radiant, at 4000

angstroms - 23200 - $\mu\text{amp}/\mu\text{watt}$

Luminous: $\blacklozenge$

At 0 cps 10 25 - amp/lumen

At 100 Mc - 22 - amp/lumen

Cathode radiant, at

4000 angstroms - 0.0464 - $\mu\text{amp}/\mu\text{watt}$

Cathode luminous:

With tungsten

light source $\blacktriangle$ 40 50 - $\mu\text{amp}/\text{lumen}$

With blue light

source $\blacklozenge$ 0.04 - μamp

Current Amplification . . - 500000 -

Equivalent Anode-Dark-

Current Input $\bullet\bullet$ - 8.5×10^{-10} 2×10^{-9} lumen

Equivalent Noise Input $\blacktriangle$. - 2×10^{-11} - lumen

With E = 750 volts (except as noted)

Sensitivity:

Radiant, at 4000

angstroms - 2320 - $\mu\text{amp}/\mu\text{watt}$

Luminous: $\blacklozenge$

At 0 cps - 2.5 - amp/lumen

Cathode radiant at

4000 angstroms - 0.0464 - $\mu\text{amp}/\mu\text{watt}$

Cathode luminous:

With tungsten

light source $\blacktriangle$ 40 50 - $\mu\text{amp}/\text{lumen}$

With blue light

source $\blacklozenge$ 0.04 - μamp

Current Amplification . . - 50000 -

$\blacklozenge$ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

$\blacktriangle$ For conditions the same as shown under ($\blacklozenge$) except that the value of light flux is 0.01 lumen and that 150 volts are applied between cathode and all other electrodes connected together as anode.

$\bullet\bullet$ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No. 5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

$\blacklozenge, \bullet, \blacktriangle$: See next page

→ Indicates a change



5819

5819

MULTIPLIER PHOTOTUBE

- ◆ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.
- ◆ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- ◆ For maximum signal-to-noise ratio, operation below 1000 volts is recommended.
- ★ under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 5819 is dependent on the magnitude of the anode current and its duration. When the 5819 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 5819 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.75 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or magnetic shielding of the 5819 may be necessary.

AVERAGE ANODE CHARACTERISTICS
are the same as those shown for Type 6199

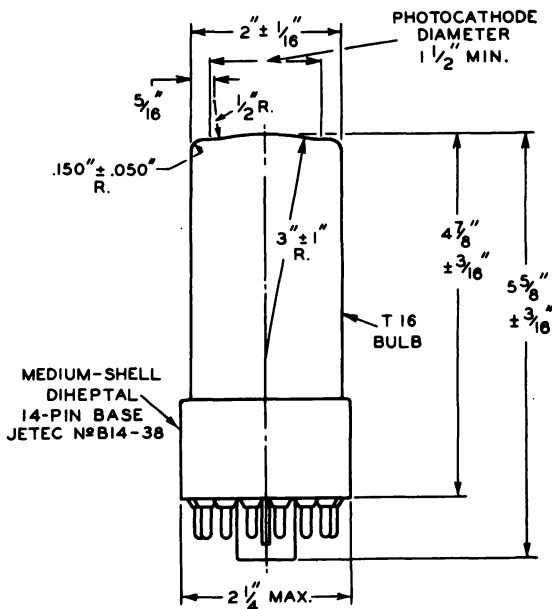
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section

5819



5819

MULTIPLIER PHOTOTUBE



☐ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

92CM-7232R3

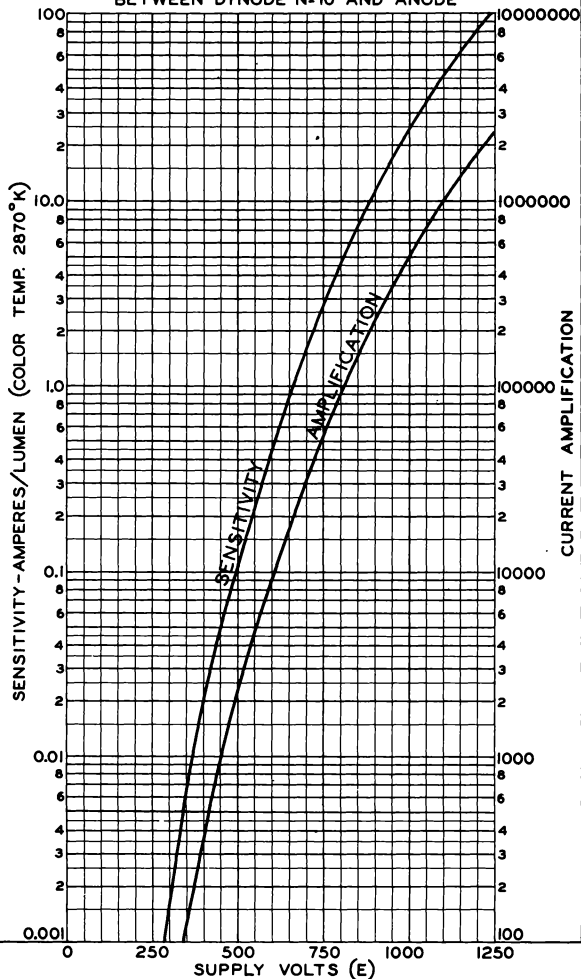


5819

5819

AVERAGE CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING $\frac{1}{6}$ OF E BETWEEN CATHODE AND DYNODE N°1; $\frac{1}{12}$ OF E FOR EACH SUCCEEDING DYNODE STAGE; AND $\frac{1}{12}$ OF E BETWEEN DYNODE N°10 AND ANODE



JUNE 30, 1953

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

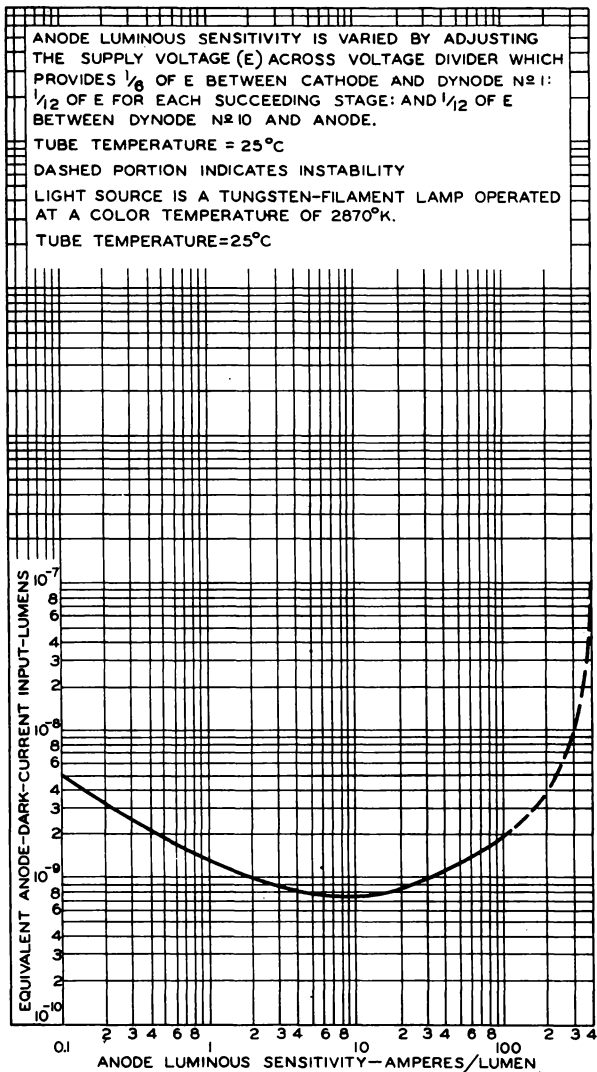
92CL-7258R3

5819



5819

TYPICAL ANODE DARK-CURRENT CHARACTERISTIC



FEB. 6, 1953

TUBE DIVISION

92CM-7920RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6199

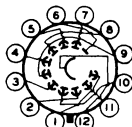
6/99

MULTIPLIER PHOTOTUBE10-STAGE, HEAD-ON TYPE WITH
1-1/4" SEMI-TRANSPARENT CATHODE AND S-4 RESPONSE**DATA****General:**

Spectral Response S-4
 Wavelength of Maximum Response 4000 $\pm$ 500 angstroms
 Cathode, Semi-transparent:
 Shape Circular
 Window:
 Area 1.2 sq. in.
 Minimum Diameter 1.24 in.
 Minimum Diameter of Flat Surface 1 in.
 Index of Refraction 1.51
 Direct Interelectrode Capacitances
 (Approx.):
 Anode to Dynode No.10 4 μf
 Anode to All Other Electrodes 7 μf
 Overall Length 4-3/8" $\pm$ 3/16"
 Seated Length 3-7/8" $\pm$ 3/16"
 Maximum Diameter 1-9/16"
 Bulb T-12
 Mounting Position Any
 Base Small-Shell Duodecal 12-Pin, Non-hygroscopic
 (JETEC No.B12-43)

BOTTOM VIEW

Pin 1 - Dynode No.1
 Pin 2 - Dynode No.3
 Pin 3 - Dynode No.5
 Pin 4 - Dynode No.7
 Pin 5 - Dynode No.9
 Pin 6 - Anode



Pin 7 - Dynode No.10
 Pin 8 - Dynode No.8
 Pin 9 - Dynode No.6
 Pin 10 - Dynode No.4
 Pin 11 - Dynode No.2
 Pin 12 - Cathode

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)[□] . . . 1250 max. volts
 SUPPLY VOLTAGE BETWEEN DYNODE No.10
 AND ANODE (DC or Peak AC) . . . 150 max. volts
 ANODE CURRENT:
 Peak 7.5 max. ma
 Average[○] 0.75 max. ma
 Average for Minimum Fatigue[○] 0.1 max. ma
 AMBIENT TEMPERATURE 75 max. °C

[□] Referred to cathode.

[○] Averaged over any interval of 30 seconds maximum.

NOV. 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode

With E = 1000 volts (except as noted)

	Min.	Av.	Max.	
Sensitivity:				
Anode, at 4000 angstroms	-	22300	-	$\mu\text{amp}/\mu\text{watt}$
Luminous:				
Anode:†				
At 0 cps	10	24	-	amp/lumen
At 100 Mc . . .	-	22	-	amp/lumen
Cathode:				
With Tungsten				
Light Source [▲]	20	40	-	$\mu\text{amp}/\text{lumen}$
With Blue				
Light Source [◆]	0.028	-	-	μamp
Current Amplification [■]	-	600000	-	
Equivalent Anode-Dark-Current Input ^{*●}	-	8×10^{-10}	2.5×10^{-9}	lumen
Equivalent Noise Input [★]	-	4×10^{-12}	-	lumen

With E = 750 volts (except as noted)

	Min.	Av.	Max.	
Sensitivity:				
Anode, at 4000 angstroms	-	2230	-	$\mu\text{amp}/\mu\text{watt}$
Luminous:				
Anode:†				
At 0 cps	-	2.4	-	amp/lumen
Cathode:				
With Tungsten				
Light Source [▲]	20	40	-	$\mu\text{amp}/\text{lumen}$
With Blue				
Light Source [◆]	0.028	-	-	μamp
Current Amplification [■]	-	60000	-	

† For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

▲ For conditions the same as shown under (†) except that the value of light flux is 0.01 lumen and that 150 volts are applied between cathode and all other electrodes connected together as anode.

◆ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

◆, ■, *, ●, ★: See next page.



6199

6199

MULTIPLIER PHOTOTUBE

- ◆ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.
- Ratio of anode sensitivity to cathode sensitivity under conditions of 2870°K tungsten light input.
- * Defined as the quotient of the dc anode dark current by the anode luminous sensitivity. It is measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give an anode luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- For maximum signal-to-noise ratio, operation below 1000 volts is recommended.
- ★ Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulse.

OPERATING NOTES

Performance of the 6199 is affected by magnetic fields. It will be observed with certain orientations of the 6199 that the earth's magnetic field is sufficient to cause a noticeable decrease in the response of the tube. Therefore, it may be desirable to provide magnetic shielding for the 6199 particularly when it is to be used in a strong magnetic field.

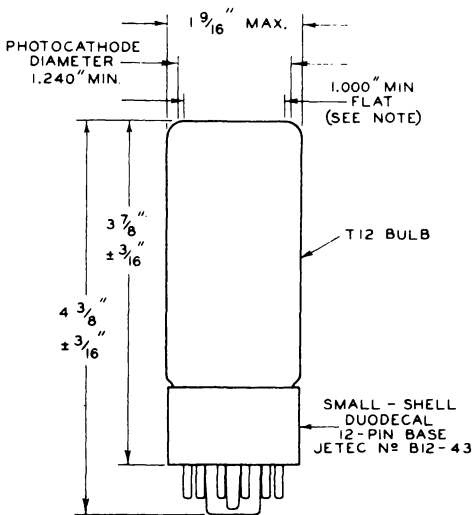
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section

6199



6199

MULTIPLIER PHOTOTUBE



NOTE: DEVIATION FROM FLATNESS WILL NOT EXCEED 0.015" FROM PEAK TO VALLEY.

⊥ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

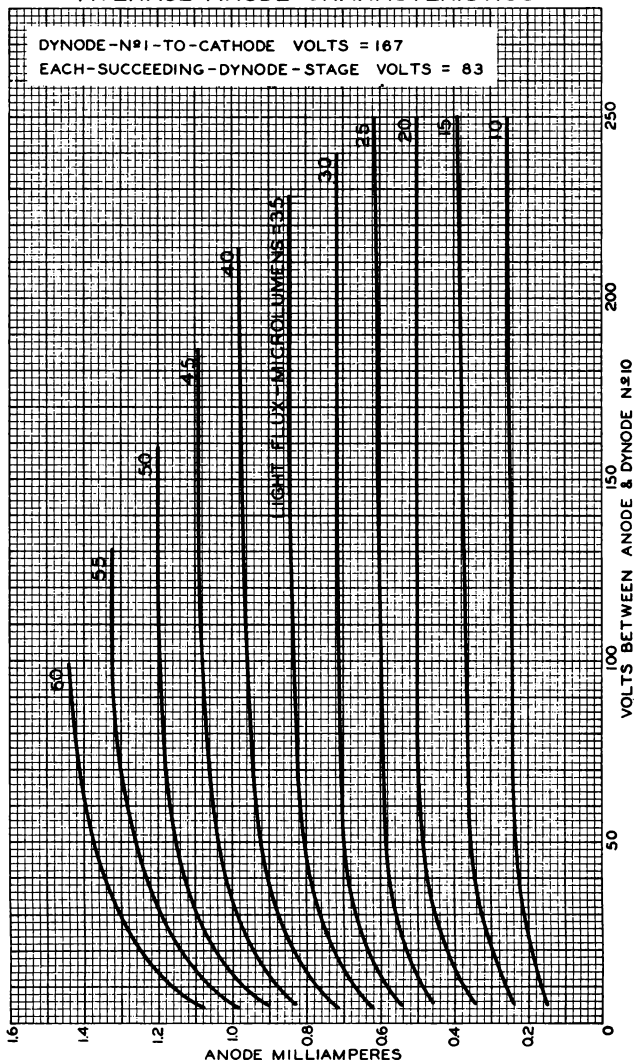
92CS - 7770



6199

6199

AVERAGE ANODE CHARACTERISTICS



JUNE 10, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

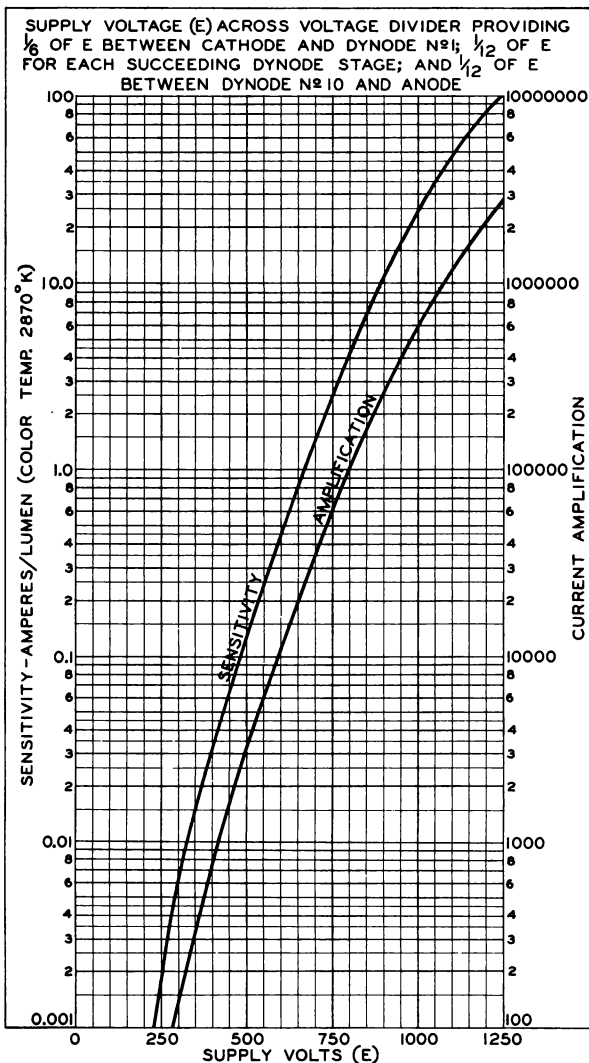
92CM-7255R3

6199



6199

AVERAGE CHARACTERISTICS



JUNE 4, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

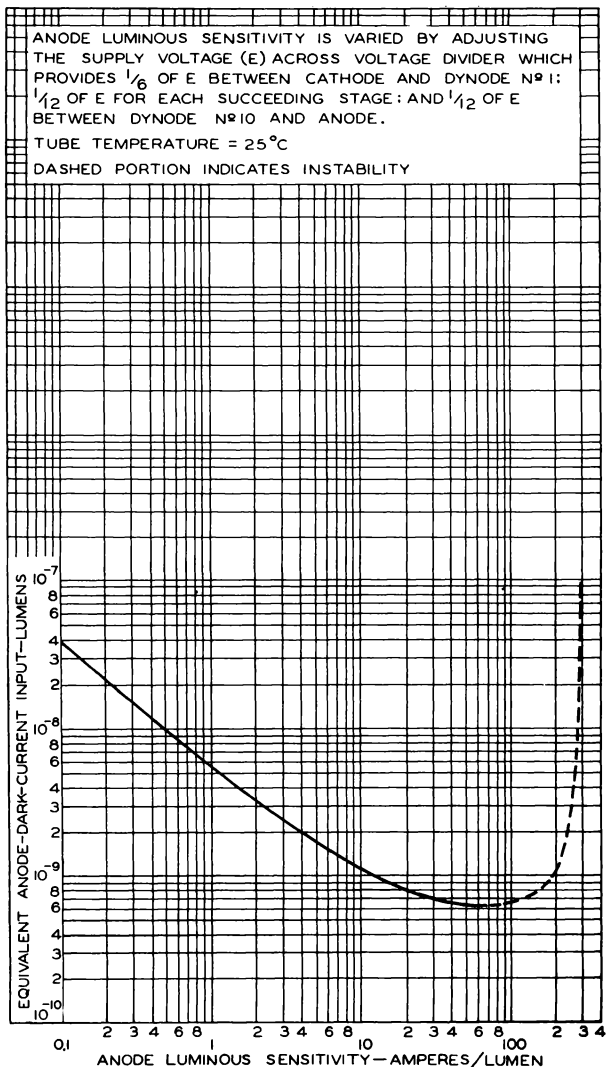
92CL-7812



6199

6199

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



JUNE 18, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7814



6217

MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH
1-1/2" SEMI-TRANSPARENT CATHODE AND S-10 RESPONSE

DATA

General:

Spectral Response S-10

Wavelength Range of Highest-

Response Region . . . 3700 to 5600 angstroms

Cathode, Semi-transparent:

Shape Circular

Window:

Area 1.8 sq. in.

Minimum Diameter 1.5 in.

Index of Refraction 1.51

Direct Interelectrode Capacitances:

Anode to Dynode No.10 4.2 μf Anode to All Other Electrodes 6.5 μf Overall Length 5-5/8" $\pm$ 3/16"Seated Length 4-7/8" $\pm$ 3/16"

Maximum Diameter 2-1/4"

Mounting Position Any

Bulb T-16

Base Medium-Shell Diheptal 14-Pin, Non-hygroscopic
(JETEC No. B14-38)

Basing Designation for BOTTOM VIEW. 14M1

Pin 1 - Dynode No.1

Pin 2 - Dynode No.2

Pin 3 - Dynode No.3

Pin 4 - Dynode No.4

Pin 5 - Dynode No.5

Pin 6 - Dynode No.6

Pin 7 - Dynode No.7

Pin 8 - Dynode No.8

Pin 9 - Dynode No.9

Pin 10 - Dynode No.10

Pin 11 - Anode

Pin 12 - No

Connection

Pin 13 - Internal Con.

Do Not Use

Pin 14 - Cathode

DIRECTION OF LIGHT:
INTO END OF BULB

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)[□] . . . 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.10

AND ANODE (DC or Peak AC) . . . 150 max. volts

ANODE CURRENT:

Peak 7.5 max. ma

Average[○] 0.75 max. maAverage for Minimum Fatigue[○] 0.1 max. ma

AMBIENT TEMPERATURE 75 max. °C

[□] Referred to cathode.[○] Averaged over any interval of 30 seconds maximum.



MULTIPLIER PHOTOTUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1000 volts (except as noted)

	Min.	Au.	Max.
Sensitivity:			
Anode, at 5400 angstroms	-	8500	- $\mu\text{amp}/\mu\text{watt}$
Luminous:			
Anode:*			
At 0 cps	10	24	- amp/lumen
At 100 Mc	-	21	- amp/lumen
Cathode:			
With Tungsten			
Light Source $\bullet$.	20	40	- $\mu\text{amp}/\text{lumen}$
With Red-Infrared			
Light Source $\#$ $\diamond$.	0.05	-	- μamp
Current Amplification $\blacksquare$.	-	600000	-
Equivalent Anode-Dark-Current Input**	-	1×10^{-8}	2.5×10^{-8} lumen
Equivalent Noise Input $\#\#$	-	4×10^{-11}	- lumen

With E = 750 volts (except as noted)

	Min.	Au.	Max.
Sensitivity:			
Anode, at 5400 angstroms	-	850	- $\mu\text{amp}/\mu\text{watt}$
Luminous:			
Anode:*			
At 0 cps	-	2.4	- amp/lumen
Cathode:			
With Tungsten . .			
Light Source $\bullet$.	20	40	- $\mu\text{amp}/\text{lumen}$
With Red-Infrared			
Light Source $\#$ $\diamond$.	0.05	-	- μamp
Current Amplification $\blacksquare$.	-	60000	-

* For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

$\bullet$ For conditions the same as shown under (*) except that the value of light flux is 0.01 lumen and that 150 volts are applied between cathode and all other electrodes connected together as anode.

$\#$ under the following conditions: Light incident on the cathode is transmitted through a red-infrared filter (combination of Corning, Glass Code Nos. 3482 and 5850 filters) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light-flux on the filter is 0.1 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode. This test evaluates the magnitude of the infrared response in the tail of the response characteristic and provides a critical criterion for the response in the red band.

$\diamond$, $\bullet$, $\bullet$, $\bullet$: See next page.



6217

6217

MULTIPLIER PHOTOTUBE

- ◆ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED RED-INFRARED FILTER at front of this section.
- Ratio of anode sensitivity to cathode sensitivity under conditions of 2870°K tungsten light input.
- ** Defined as the quotient of the dc anode dark current by the anode luminous sensitivity. After tube has been in the dark for 30 minutes, the equivalent dark-current input is measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give an anode luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- ## Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING NOTES

Performance of the 6217 is affected by magnetic fields. It will be observed with certain orientations of the 6217 that the earth's magnetic field is sufficient to cause a noticeable decrease in the response of the tube. Therefore, it may be desirable to provide magnetic shielding for the 6217 particularly when it is to be used in a strong magnetic field.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-10 Response
is shown at the front of this Section

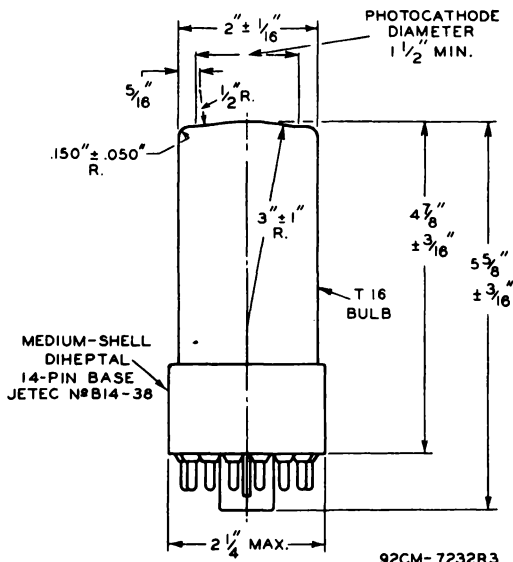
AVERAGE ANODE CHARACTERISTICS,
SENSITIVITY CHARACTERISTIC,
and
CURRENT AMPLIFICATION CHARACTERISTIC
are the same as those shown for Type 6199

6217



6217

MULTIPLIER PHOTOTUBE



CL OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM THE PERPENDICULAR
ERECTED AT THE CENTER OF BOTTOM OF THE BASE.



6323

6323

MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE

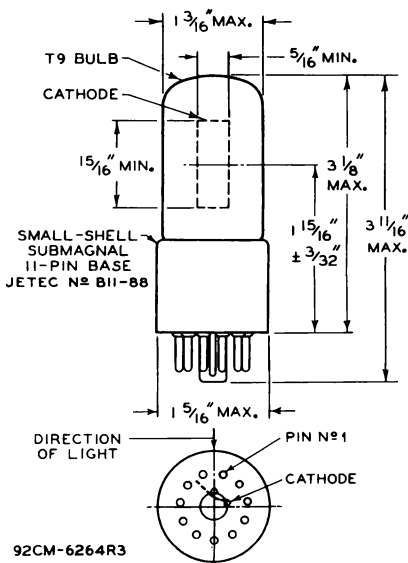
For Headlight-Control Service

The 6323 is the same as the 6328 except for the following items:

General:

Direct Interelectrode Capacitances (Approx.):

Anode to dynode No.9.	4.4	$\mu\mu\text{f}$
Anode to all other electrodes	6	$\mu\mu\text{f}$
Maximum Overall Length.	3-11/16"	
Maximum Seated Length	3-1/8"	
Length from Base Seat to Center of Useful Cathode Area.	1-15/16" $\pm$ 3/32"	
Weight (Approx.).	1.6 oz	
Base.	Small-Shell Submagnal 11-Pin (JETEC No.B11-88), Non-hygroscopic	



92CM-6264R3

BOTTOM VIEW

☿ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE THROUGH PINS No.1 AND No.11 AND THE PLANE OF THE GRILL WILL NOT EXCEED 6°.

SEPT. 1, 1955

TUBE DIVISION

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6328

6328

MULTIPLIER PHOTOTUBE9-STAGE TYPE WITH S-4 RESPONSE
FOR HEADLIGHT-CONTROL SERVICE**DATA****General:**Spectral Response S-4
Wavelength of Maximum Response 4000 ± 500 angstroms
Cathode:Minimum Projected Length* $15/16"$
Minimum Projected Width* $5/16"$

Direct Interelectrode Capacitances:

Anode to Dynode No.9 4.2 $\mu\mu f$
Anode to All Other Electrodes 5.5 $\mu\mu f$ Maximum Overall Length $3-1/8"$ Maximum Seated Length $2-11/16"$

Length from Base Seat to Center

of Useful Cathode Area $1-9/16" \pm 3/32"$ Maximum Diameter $1-5/16"$

Bulb T-9

Mounting Position Any

Base Small-Shell Neosubmagnal 11-Pin, Non-hygroscopic
(JETEC No.811-104)

Basing Designation for BOTTOM VIEW 11K

Pin 1: Dynode No.1

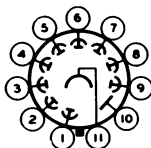
Pin 2: Dynode No.2

Pin 3: Dynode No.3

Pin 4: Dynode No.4

Pin 5: Dynode No.5

Pin 6: Dynode No.6



Pin 7: Dynode No.7

Pin 8: Dynode No.8

Pin 9: Dynode No.9

Pin 10: Anode

Pin 11: Cathode

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.9

AND ANODE (DC or Peak AC) 250 max. volts

AVERAGE ANODE CURRENT^o 0.1 max. ma

AMBIENT TEMPERATURE 75 max. °C

* on plane perpendicular to the indicated direction of light (see *Dimensional Outline*).^o Averaged over any interval of 30 seconds maximum.

6328



6328

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No. 1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No. 9 and anode

With E = 1000 volts

	Min.	Av.	Max.	
Sensitivity:				
Radiant, at 4000 angstroms	—	32500	—	$\mu\text{amp}/\mu\text{watt}$
Luminous: [▲]				
At 0 cps	5	35	250	amp/lumen
At 100 Mc	—	33	—	amp/lumen
Electrode Dark Current (At 25°C):				
Anode	—	—	0.1	μamp
Any other electrode	—	—	0.75	μamp

[▲] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

OPERATING CONSIDERATIONS

The *operating stability* of the 6328 is dependent on the magnitude of the anode current and its duration. When the 6328 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6328 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.1 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes.

A recommended design of voltage-divider network for use with the 6328 to provide stable operation and long tube life is shown in the accompanying circuit. This design provides linear operation within the range normally required for dimming. At higher light levels, the network design limits the tube output to a safe value. The indicated design values provide dimming operation for an anode current in the range between 5 and 10 microamperes.

MARCH 1, 1954

TUBE DEPARTMENT

TENTATIVE DATA

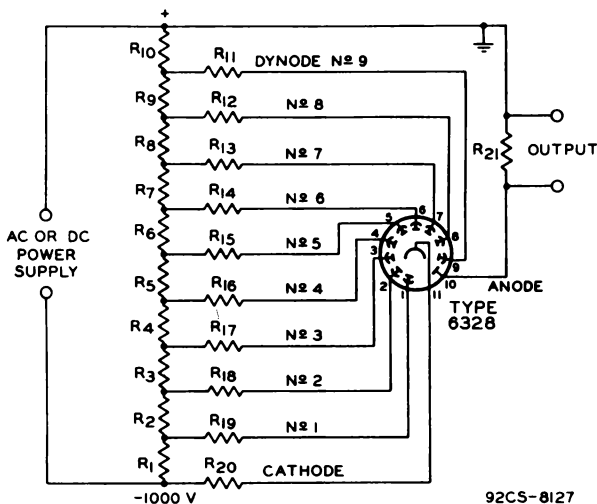
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6328

6328

MULTIPLIER PHOTOTUBE

RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE
WITH TYPE 6328 IN HEADLIGHT DIMMING SERVICER₁ R₂ R₃ R₄ R₅R₆ R₇ R₈ R₉ R₁₀: 1 megohm, 1/2 wattR₁₁: 2 megohms, 1/2 wattR₁₂: 5.1 megohms, 1/2 wattR₁₃ R₁₄ R₁₅ R₁₆R₁₇ R₁₈ R₁₉ R₂₀: 8.2 megohms, 1/2 wattR₂₁: 820,000 ohms, 1/2 watt

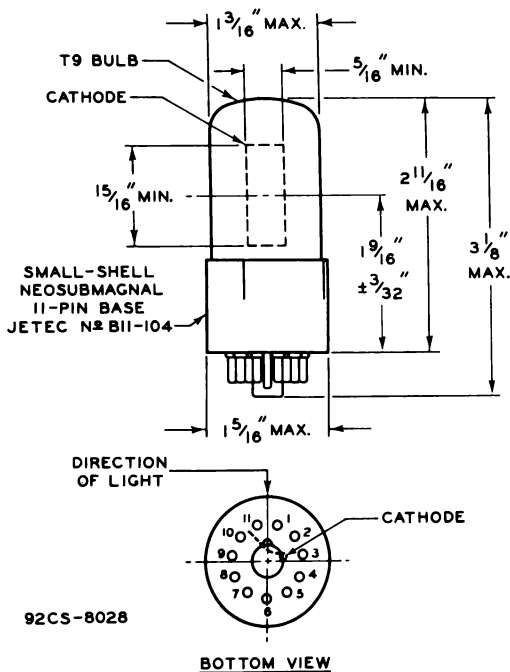
Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

6328



6328

MULTIPLIER PHOTOTUBE



☉ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

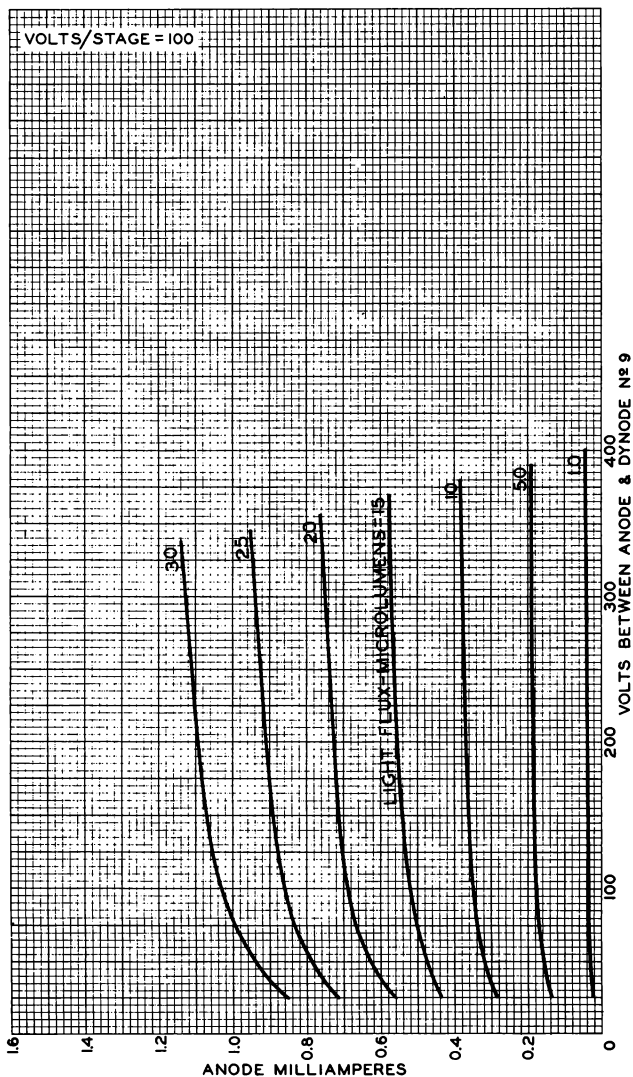
NOTE: THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE THROUGH PINS No. 1 AND No. 11 AND THE PLANE OF THE GRILL WILL NOT EXCEED 6° .



6328

6328

AVERAGE ANODE CHARACTERISTICS



JULY 1, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8029

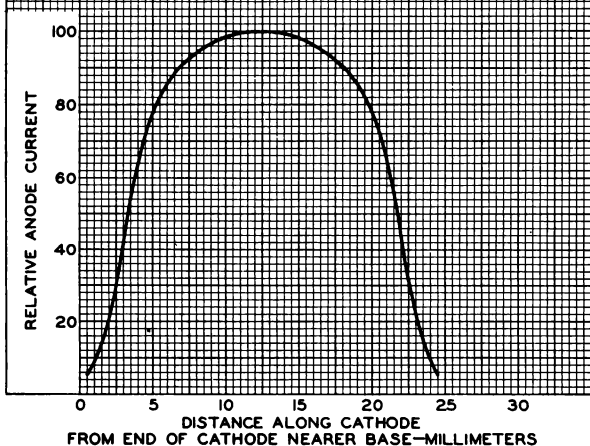
6328



6328

VARIATION IN SENSITIVITY OF
PHOTOCATHODE ALONG ITS LENGTH

SPOT SIZE: 1 MM APPROX.

VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED

MAR. 18, 1954

TUBE DEPARTMENT

92CM-7663R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

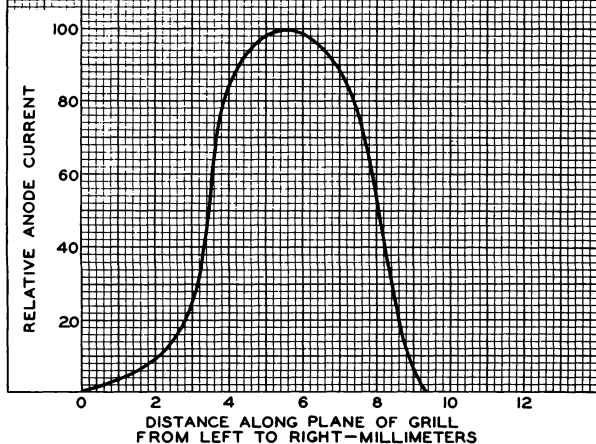


6328

6328

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL

SPOT SIZE: 1 MM APPROX.
GRILL TOWARD OBSERVER, BASE DOWN
CATHODE WIDTH PROJECTED NORMAL
TO PLANE OF GRILL
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



MAR. 18, 1954

TUBE DEPARTMENT

92CM-7667R1

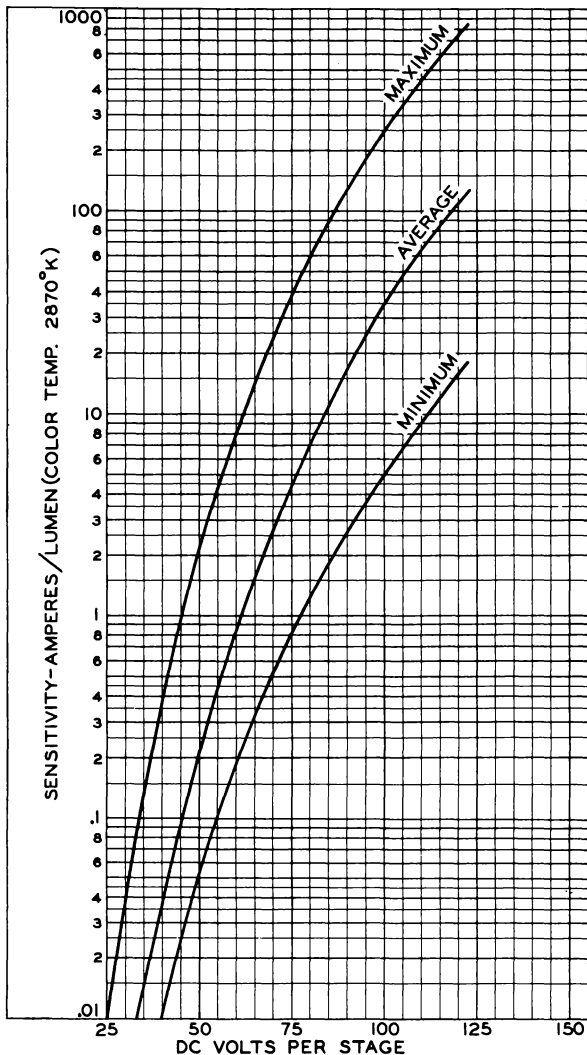
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6328



6328

RANGE OF LUMINOUS SENSITIVITY



JUNE 29, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8027



6342

6342

MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH
1-11/16" SEMITRANSSPARENT CATHODE AND S-11 RESPONSE
SHORT TIME-RESOLUTION CAPABILITY

DATA**General:**

Spectral Response. S-11 ←
Wavelength of Maximum Response 4400 ± 500 angstroms ←
Cathode, Semitransparent:
Shape. Circular
Window:
Area 2.2 sq. in. ←
Minimum diameter 1-11/16 in. ←
Index of refraction. 1.51
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.10. 4.4 μμf
Anode to all other electrodes. 7 μμf
Maximum Overall Length 5-13/16" ←
Seated Length. 4-7/8" ± 3/16"
Maximum Diameter 2-1/4"
Mounting Position. Any
Weight (Approx.) 5.2 oz ←
Bulb T-16
Base Medium-Shell Diheptal 14-Pin (JETEC No.B14-38),
Non-hygroscopic

BOTTOM VIEW

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9



Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - Internal
Connection-
Do Not Use
Pin 13 - Focusing
Electrode
Pin 14 - Cathode

DIRECTION OF LIGHT:
INTO END OF BULB

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 1500 max. volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10
AND ANODE (DC or Peak AC). 250 max. volts ←
DYNODE-No.1 SUPPLY VOLTAGE
(DC or Peak AC). 400 max. volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC) 400 max. volts
AVERAGE ANODE CURRENT 2 max. ma
AMBIENT TEMPERATURE. 75 max. °C

● Averaged over any interval of 30 seconds maximum.

← Indicates a change.

SEPT. 1, 1955

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6342



6342

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode

With E = 1250 volts (except as noted) and
Focusing Electrode* connected to Dynode No.1 at socket

	Min.	Median	Max.	
Sensitivity:				
→ Radiant, at				
4400 angstroms .	-	6000	-	$\mu\text{amp}/\mu\text{watt}$
→ Cathode radiant,				
at 4400 angstroms .	-	0.048	-	$\mu\text{amp}/\mu\text{watt}$
Luminous:●				
At 0 cps	3	7.5	100	amp/lumen
Cathode luminous:				
With tungsten				
light source▲ .	40	60	-	$\mu\text{amp}/\text{lumen}$
With blue light				
source◆ .	0.04	-	-	μamp
Current Amplification. .	-	125000	-	
Equivalent Anode-Dark-				
Current Input■ .	-	2×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input★ .	-	7×10^{-12}	-	lumen

With E = 1500 volts (except as noted) and
Focusing Electrode* connected to Dynode No.1 at socket

	Min.	Median	Max.	
Sensitivity:				
→ Radiant, at				
4400 angstroms .	-	28000	-	$\mu\text{amp}/\mu\text{watt}$
→ Cathode radiant,				
at 4400 angstroms .	-	0.048	-	$\mu\text{amp}/\mu\text{watt}$
Luminous:●				
At 0 cps	-	35	-	amp/lumen
Cathode luminous:				
With tungsten				
light source▲ .	40	60	-	$\mu\text{amp}/\text{lumen}$
With blue light				
source◆ .	0.04	-	-	μamp
Current Amplification. .	-	600000	-	

* In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.

● For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

▲, ◆, ◆, ◆, ■, ★: See next page.

→ Indicates a change.

SEPT. 1, 1955

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6342

6342

MULTIPLIER PHOTOTUBE

- ▲ For conditions the same as shown under (b) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.
- ⦿ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No. 5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.
- ◆ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.
- ⊛ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.
- ★ Under the following conditions: Supply voltage (E) is 1250 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 6342 is dependent on the magnitude of the anode current and its duration. When the 6342 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6342 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or magnetic shielding of the 6342 may be necessary.

The *material* of which the dynodes of the 6342 are made has stable, high-current carrying capabilities and permits the use of a tube manufacturing process which minimizes regenerative effects such as afterpulses. The relative freedom of the 6342 from afterpulses and its small spread in electron transit time make it particularly useful for fast coincidence scintillation counting.

Because the 6342 offers the advantage of small spread in electron transit time, it has a fast pulse rise time. For an input pulse having a rise time of 1 millimicrosecond or less, the rise time of the pulse at the anode is about

6342

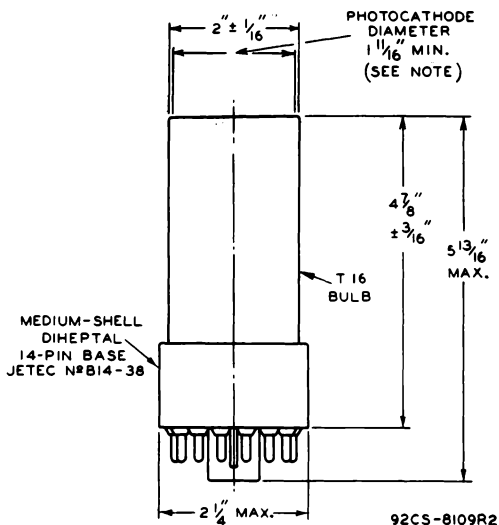


6342

MULTIPLIER PHOTOTUBE

5 millimicroseconds as measured between its 10- and 90-per cent magnitude points when the supply voltage is 1500 volts and the focusing electrode is connected to dynode No. 1.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section



Ø OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM THE PERPENDICULAR
ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLAT-
NESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

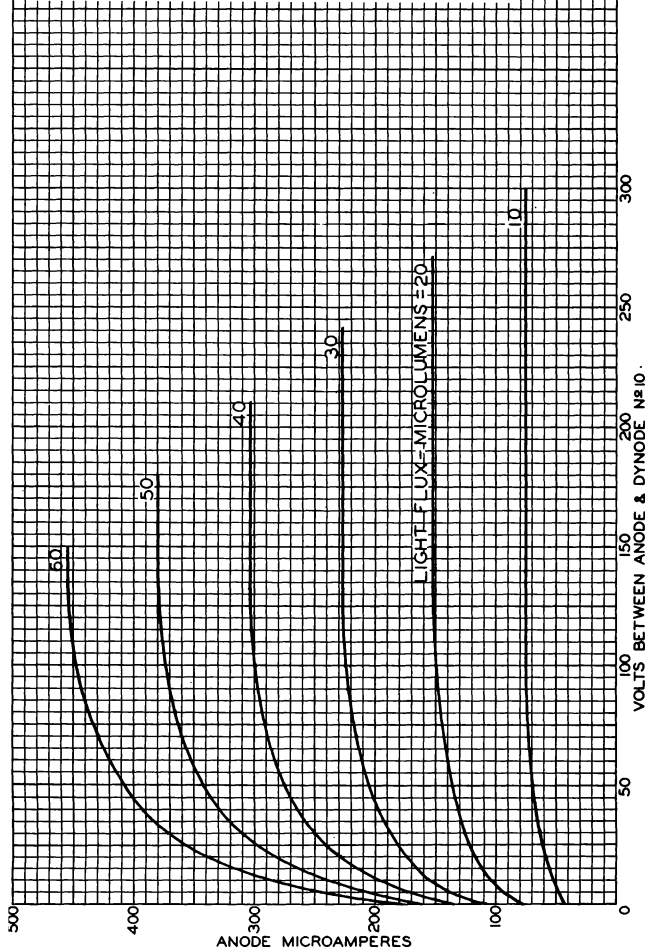


6342

6342

AVERAGE ANODE CHARACTERISTICS

DYNODE-N^o1-TO-CATHODE VOLTS = 208
EACH-SUCCESSING-DYNODE STAGE VOLTS = 104
FOCUSING ELECTRODE CONNECTED TO DYNODE N^o1
LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP
OPERATED AT A COLOR TEMPERATURE OF 2870°K.



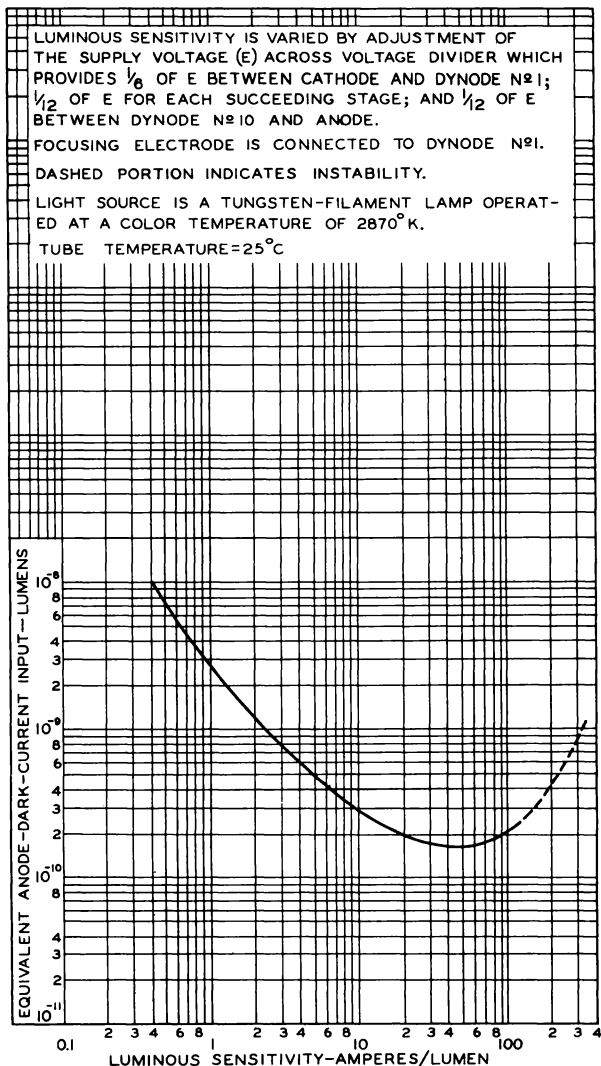
JULY 27, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8125R1



TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



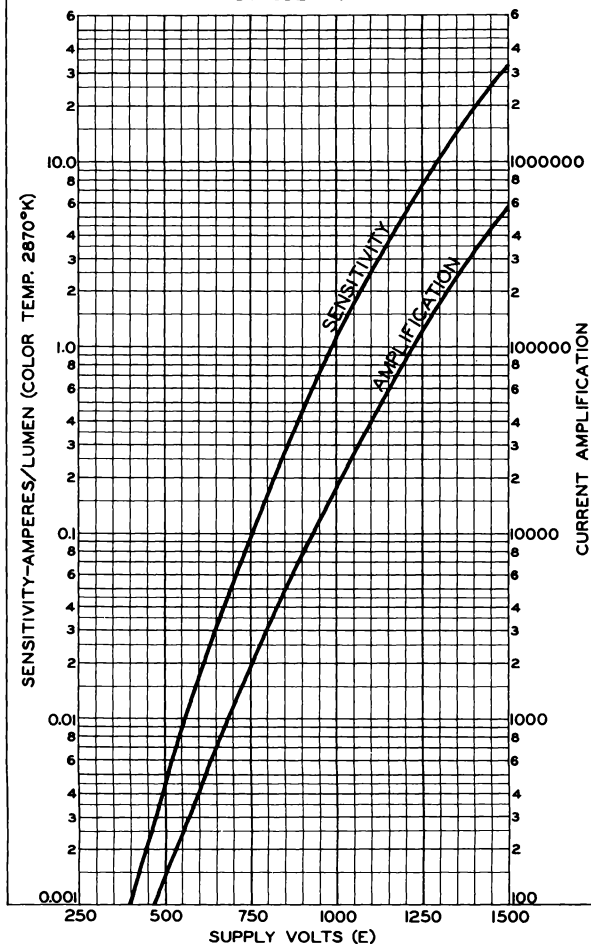


6342

6342

AVERAGE CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING $\frac{1}{6}$ OF E BETWEEN CATHODE AND DYNODE N^o1; $\frac{1}{12}$ OF E FOR EACH SUCCEEDING DYNODE STAGE; AND $\frac{1}{12}$ OF E BETWEEN DYNODE N^o10 AND ANODE
FOCUSING ELECTRODE IS CONNECTED TO DYNODE N^o1



OCT. 15, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8123



6372

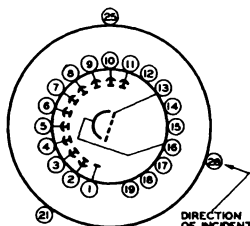
6372

MULTIPLIER PHOTOTUBE10-STAGE TYPE WITH
4-1/8" x 3" SEMITRANSSPARENT CATHODE AND S-11 RESPONSE**DATA****General:**

Spectral Response. S-11 ←
Wavelength of Maximum Response 4400 ± 500 angstroms ←
Cathode, Semitransparent:
Shape. Semicylindrical
Window:
Minimum length 4-1/8 in.
Minimum width (Along
circumference of bulb) 3 in.
Minimum area 12-3/8 sq. in.
Index of refraction. 1.48
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.10. 5 μmf
Anode to all other electrodes. 6.5 μmf
Maximum Overall Length 7-3/4"
Maximum Seated Length. 7-1/4"
Length from Base Seat to Center
of Useful Cathode Area 3-5/8" ± 1/8"
Maximum Diameter 2-9/16"
Mounting Position. Any
Weight (Approx.) 9 oz
Bulb T-20
Base Small-Button Twentyninar 22-Pin (JETEC No.E22-16)

BOTTOM VIEW

- Pin 1 - Anode
Pin 2 - Dynode No.10
Pin 3 - Dynode No.9
Pin 4 - Dynode No.8
Pin 5 - Dynode No.7
Pin 6 - Dynode No.6
Pin 7 - Dynode No.5
Pin 8 - Dynode No.4
Pin 9 - Dynode No.3
Pin 10 - Dynode No.2
Pin 11 - Dynode No.1
Pin 12 - Internal Connec-
tion-Do Not Use
Pin 13 - Focusing
Electrode
Pin 14 - Same as Pin 12
Pin 15 - Same as Pin 12
Pin 16 - Cathode
Pin 17 - Same as Pin 12
Pin 18 - Same as Pin 12
Pin 19 - Same as Pin 12
Pin 21 - Same as Pin 12
Pin 25 - Same as Pin 12
Pin 28 - Same as Pin 12



PINS 1-19: ON 1 7/8" DIA. PIN CIRCLE
PINS 21, 25, 28: ON 1 5/8" DIA. PIN CIRCLE
PIN CIRCLES ARE CONCENTRIC

← Indicates a change.



MULTIPLIER PHOTOTUBE

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	1200 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	180 max.	volts
DYNODE-No.1 SUPPLY VOLTAGE (DC or Peak AC)	300 max.	volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC)	300 max.	volts
AVERAGE ANODE CURRENT*	0.75 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across a voltage divider providing 1/12 of E between cathode and focusing electrode; 1/12 of E between focusing electrode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode

With E=1000 volts (except as noted)

	Min.	Median	Max.	
Sensitivity:				
→ Radiant, at 4400 angstroms. .	-	16000	-	μamp/μwatt
→ Cathode radiant, at 4400 angstroms	-	0.026	-	μamp/μwatt
Luminous:†				
At 0 cps.	5	20	-	amp/lumen
At 100 Mc.	-	19	-	amp/lumen
Cathode luminous:				
With tungsten light source▲	20	33	-	μamp/lumen
With blue light source†‡	0.026	-	-	μamp
Current Amplification	-	600000	-	
Equivalent Anode- Dark-Current Input*§	-	5 × 10 ⁻⁹	1 × 10 ⁻⁸	lumen
Equivalent Noise Input**	-	1 × 10 ⁻¹⁰	-	lumen

* Averaged over any interval of 30 seconds maximum.

† For conditions when the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

▲ For conditions the same as shown under (†) except that the value of light flux is 0.01 lumen and 150 volts are applied between cathode and all other electrodes connected together as anode.

‡ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

◆, ♦, *, §: See next page.

→ Indicates a change.



6372

6372

MULTIPLIER PHOTOTUBE

- ♦ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.
- Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- * Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

OPERATING CONSIDERATIONS

The *operating stability* of the 6372 is dependent on the magnitude of the anode current and its duration. When the 6372 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6372 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.75 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or *magnetic shielding* of the 6372 may be necessary.

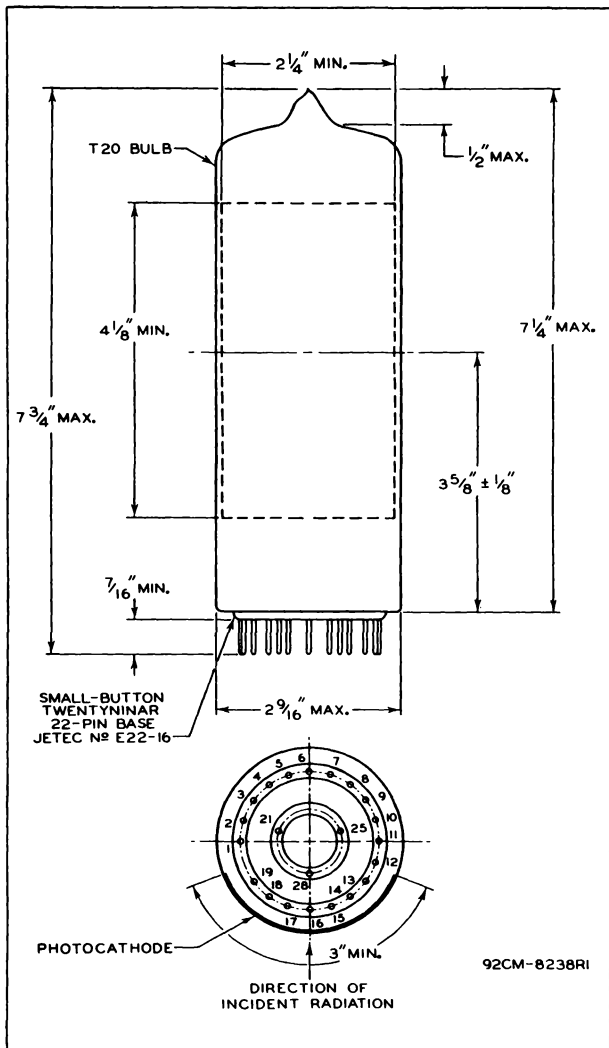
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section

6372



6372

MULTIPLIER PHOTOTUBE



SEPT. 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

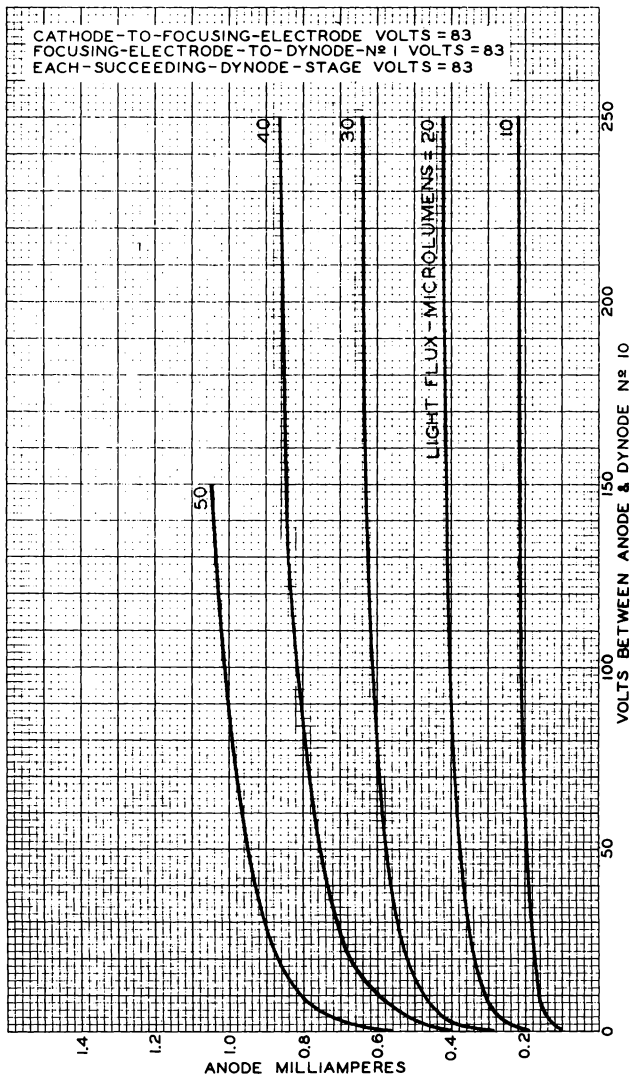
CE-8238R1



6372

6372

AVERAGE ANODE CHARACTERISTICS



FEB. 26, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

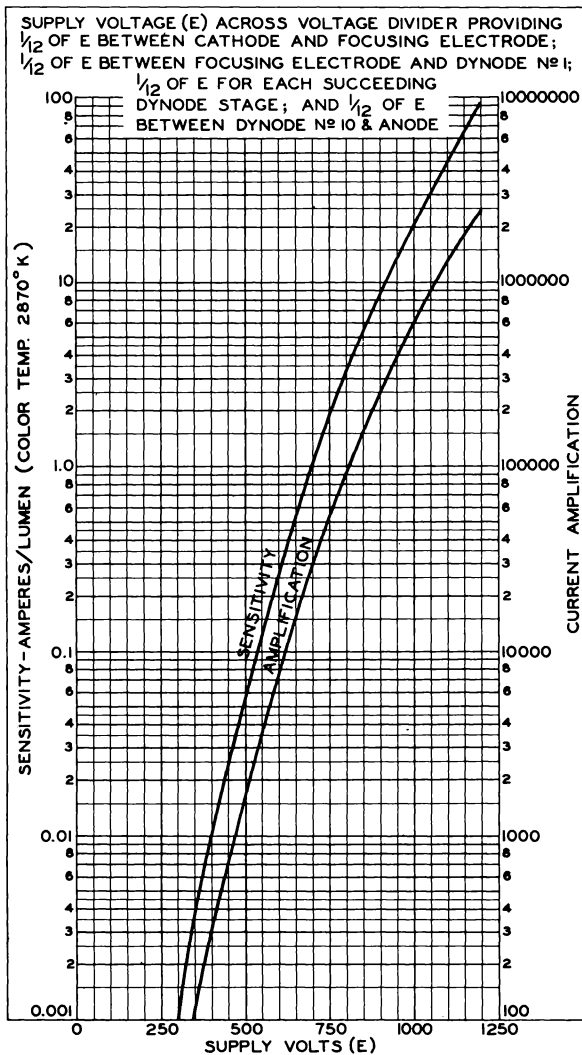
92CM-8258

6372



6372

AVERAGE CHARACTERISTICS



FEB. 26, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8257

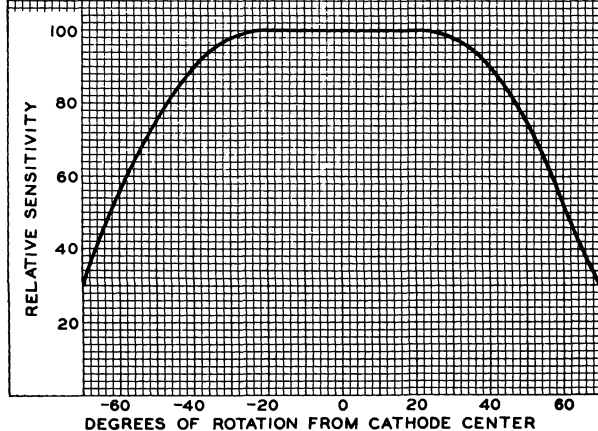


6372

6372

VARIATION IN SENSITIVITY

LIGHT SPOT: $\frac{1}{2}$ INCH DIA. APPROX. POSITIONED
MIDWAY ALONG LENGTH OF PHOTOCATHODE
VARIATIONS CAUSED BY INTERCEPTION OF
LIGHT BY GRILL HAVE BEEN IGNORED



APRIL 9, 1954

TUBE DIVISION

92CM-8304

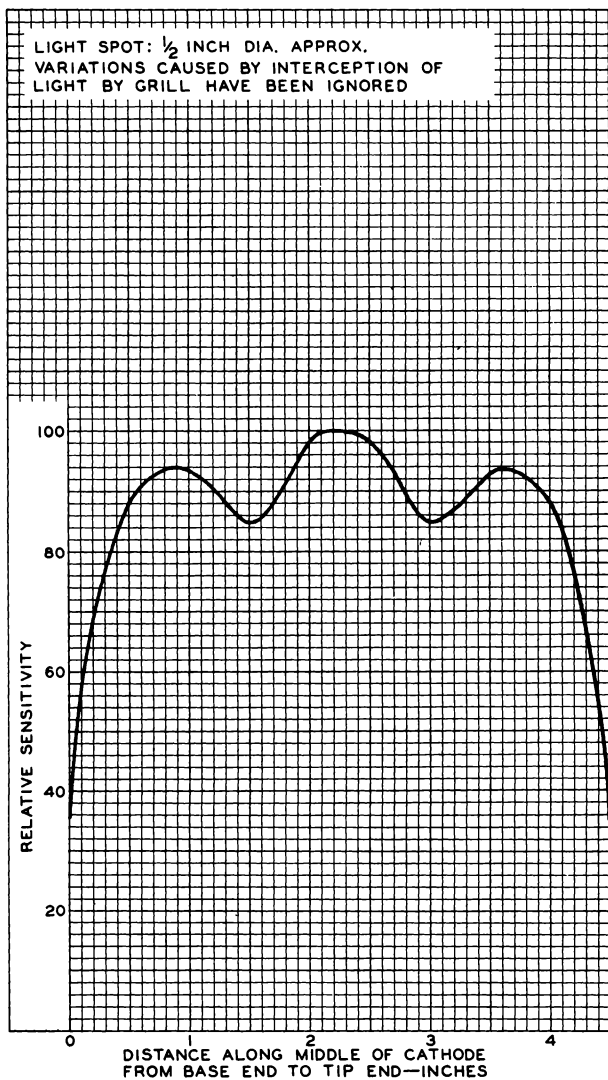
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6372



6372

VARIATION IN SENSITIVITY



APRIL 9, 1954

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8306



6405

6405/1640

GAS PHOTOTUBE

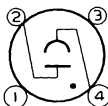
LOW-MICROPHONIC TYPE WITH S-1 RESPONSE

DATA**General:**

Spectral Response S-1
Wavelength of Maximum Response 8000 $\pm$ 1000 angstroms
Cathode:
Shape Semicylindrical
Minimum projected length* 1-1/4"
Minimum projected width* 5/8"
Direct Interelectrode Capacitance 3 μ f
Overall Length 4-5/16" $\pm$ 1/8"
Seated Length 3-11/16" $\pm$ 1/8"
Seated Length to Center of Cathode 2-1/8" $\pm$ 3/32"
Maximum Diameter 1-1/8"
Mounting Position Any
Weight (Approx.) 1.3 oz
Bulb T-8
Base Dwarf-Shell Small 4-Pin (JETEC No. A4-26),
Non-hygroscopic

BOTTOM VIEW

Pin 1 - No
Connection
Pin 2 - Anode



Pin 3 - No
Connection
Pin 4 - Cathode

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:

	Rating I	Rating II	
ANODE-SUPPLY VOLTAGE (DC or Peak AC)	70 max.	90 max.	volts
AVERAGE CATHODE- CURRENT DENSITY	50 max.	25 max.	μ amp/sq. in.
AVERAGE CATHODE CURRENT ^o	10 max.	5 max.	μ amp
AMBIENT TEMPERATURE	100 max.	100 max.	$^{\circ}$ C

Characteristics at 90 Volts on Anode:

	Min.	Av.	Max.
Sensitivity: Radiant at 8000 angstroms	-	0.0135	-
			μ amp/ μ watt

* On plane perpendicular to indicated direction of incident light.

^o Averaged over any interval of 30 seconds maximum.

6405



6405

GAS PHOTOTUBE

	Min.	Av.	Max.	
Sensitivity:				
Luminous: [▲]				
At 0 cps	80	135	200	μ amp/lumen
At 5000 cps	-	116	-	μ amp/lumen
At 10000 cps	-	100	-	μ amp/lumen
Sensitivity Difference				
Between Highest Value				
and Lowest Value Along				
Cathode Length [▲]	-	-	25	μ amp/lumen
Gas Amplification Factor .	-	-	9	
Anode Dark Current:				
At 25°C	-	-	0.1	μ amp
Minimum Circuit Values:				
With anode-supply voltage of	70 or less		90	volts
DC Load Resistance:				
For dc currents above				
5 μ amp	0.1 min.	-		megohm
For dc currents below				
5 μ amp	0 min.	-		megohm
For dc currents above				
3 μ amp	-	2.5 min.		megohms
For dc currents below				
3 μ amp	-	0.1 min.		megohm
[▲] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A dc anode supply of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurements, a light input of 0.1 lumen is used. For the 5000 and 10000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean.				
[◆] Measured under the same conditions as indicated under ([▲]) with light input of 0.1 lumen and a light spot 1/2 inch in diameter.				
SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-1 Response and FREQUENCY-RESPONSE CHARACTERISTICS of Gas Phototubes are shown at the front of this Section				

JUNE 14, 1954

TUBE DIVISION

TENTATIVE DATA

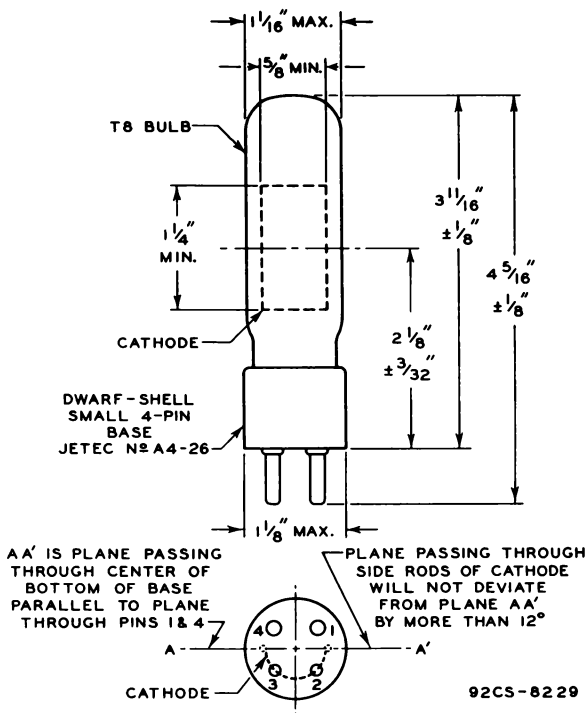
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6405

6405

GAS PHOTOTUBE

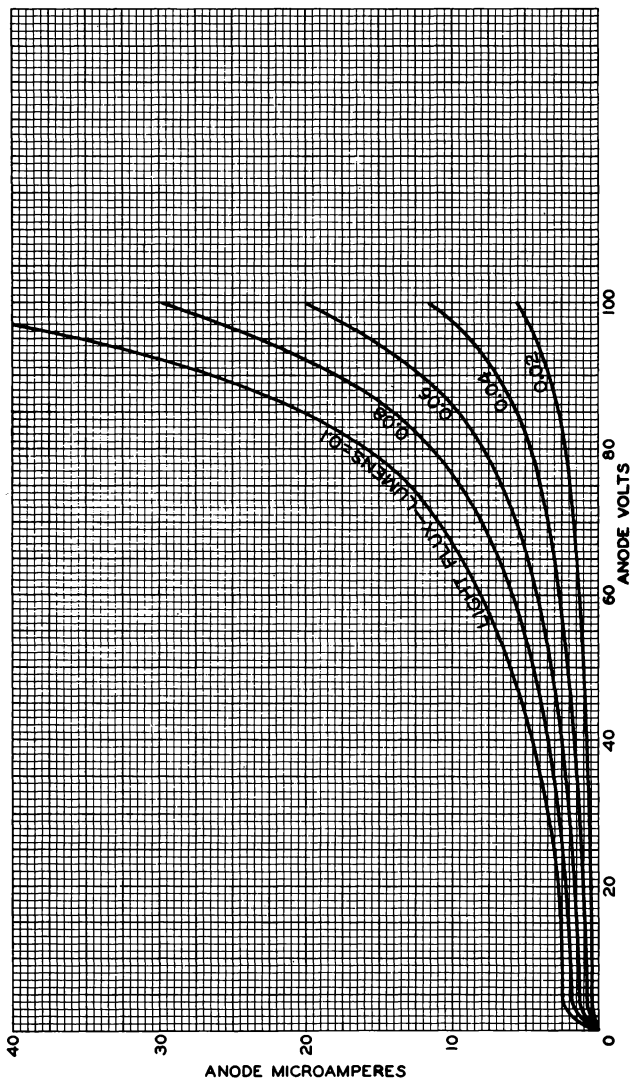


6405



6405

AVERAGE ANODE CHARACTERISTICS



JAN. 22, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8227



6472

MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE

For Headlight-Control Service

6472

DATA

General:

Spectral Response S-4

Wavelength of Maximum Response. 4000 ± 500 angstroms

Cathode:

Minimum projected length* $15/16$ "Minimum projected width* $5-16$ "

Direct Interelectrode Capacitances:

Anode to dynode No.9 4.2 $\mu\mu\text{f}$ Anode to all other electrodes 5.5 $\mu\mu\text{f}$ Maximum Overall Length (Excluding leads). $2-3/4$ "Maximum Envelope Length (Excluding tip) $2-1/4$ "

Length from Envelope Seal to

Center of Useful Cathode Area $1-1/4" \pm 3/32"$ Maximum Diameter. $1-3/16$ "

Bulb T-9

Mounting Position Any

Weight (Approx.). 2 oz

Terminals, Flexible Lead. See Dimensional Outline

BOTTOM VIEW

Lead 1 - Cathode

Lead 2 - Dynode No.1

Lead 3 - Dynode No.2

Lead 4 - Dynode No.3

Lead 5 - Dynode No.4

Lead 6 - Dynode No.5



Lead 7 - Dynode No.6

Lead 8 - Dynode No.7

Lead 9 - Dynode No.8

Lead 10 - Dynode No.9

Lead 11 - Anode

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.9

AND ANODE (DC or Peak AC) 250 max. volts

AVERAGE ANODE CURRENT^o. 0.1 max. ma

AMBIENT TEMPERATURE 75 max. °C

* On plane perpendicular to the indicated direction of light (See Dimensional Outline).

^o Averaged over any interval of 30 seconds maximum.

6472



6472

MULTIPLIER PHOTOTUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Under conditions with supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No. 1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No. 9 and anode

With $E = 1000$ volts

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4000 angstroms	—	32500	—	$\mu\text{amp}/\mu\text{watt}$
Luminous:▲				
At 0 cps	5	35	250	amp/lumen
At 100 Mc.	—	33	—	amp/lumen
Electrode Dark Current				
(At 25°C):				
Anode.	—	—	0.25 [♠]	μamp
Any other electrode. . . .	—	—	0.75	μamp

▲ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

♠ With sine-wave, 60-cycle supply voltage adjusted to give sensitivity of 7.5 amperes per lumen.

OPERATING CONSIDERATIONS

The *operating stability* of the 6472 is dependent on the magnitude of the anode current and its duration. When the 6472 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6472 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.1 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes.

A recommended design of voltage-divider network for use with the 6472 to provide stable operation and long tube life is shown in the accompanying circuit. This design provides linear operation within the range normally required for dimming. At higher light levels, the network design limits the tube output to a safe value. The indicated design values provide dimming operation for an anode current in the range between 5 and 10 microamperes on basis of dc operation. When operation at other current values is desired, the values of the resistors can be changed proportionately.

MAY 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

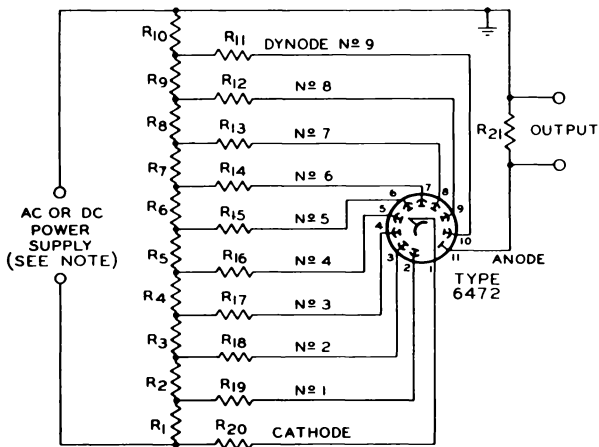
TENTATIVE DATA



6472

6472

MULTIPLIER PHOTOTUBE

RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE
WITH TYPE 6472 IN HEADLIGHT-DIMMING SERVICE

R1 R2 R3 R4 R5

R6 R7 R8 R9 R10: 1 megohm, 1/2 watt

R11: 2 megohms, 1/2 watt

R12: 5.1 megohms, 1/2 watt

R13 R14 R15 R16

R17 R18 R19 R20: 8.2 megohms, 1/2 watt

R21: 820,000 ohms, 1/2 watt

NOTE: Adjustable between approximately 500
and 1000 volts dc or peak ac.

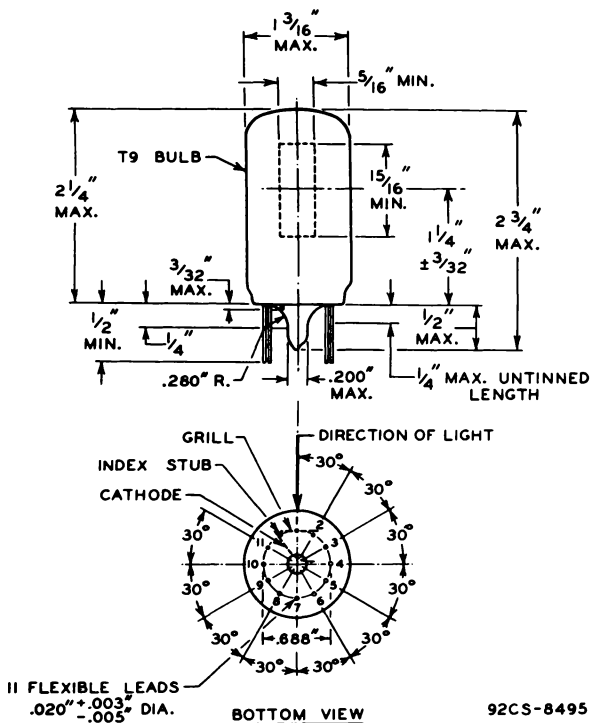
Devices and arrangements shown or described herein may
use patents of RCA or others. Information contained
herein is furnished without responsibility by RCA for
its use and without prejudice to RCA's patent rights.

6472



6472

MULTIPLIER PHOTOTUBE



THE ANGULAR VARIATION BETWEEN THE PLANE THROUGH LEAD No. 1 AND TUBE AXIS AND THE PLANE PERPENDICULAR TO THE PLANE OF THE GRILL WILL NOT EXCEED 20° .

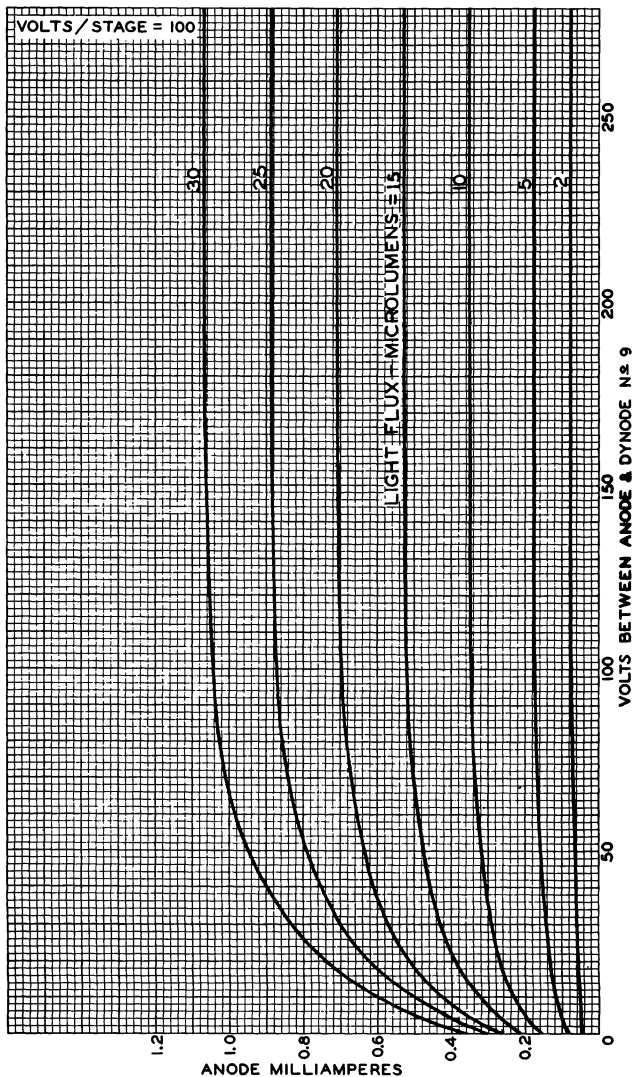
SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at front of this Section



6472

6472

AVERAGE ANODE CHARACTERISTICS



JAN. 29, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 8029R1

6472

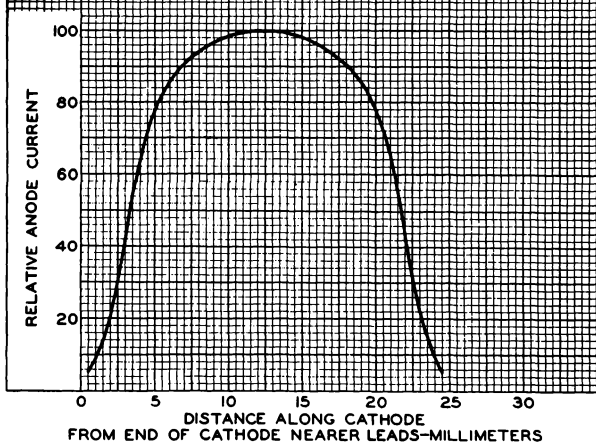


6472

6472

VARIATION IN SENSITIVITY OF PHOTOCATHODE ALONG ITS LENGTH

SPOT SIZE: 1MM APPROX.
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



FEB. 11, 1955

TUBE DIVISION

92CM-8535

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

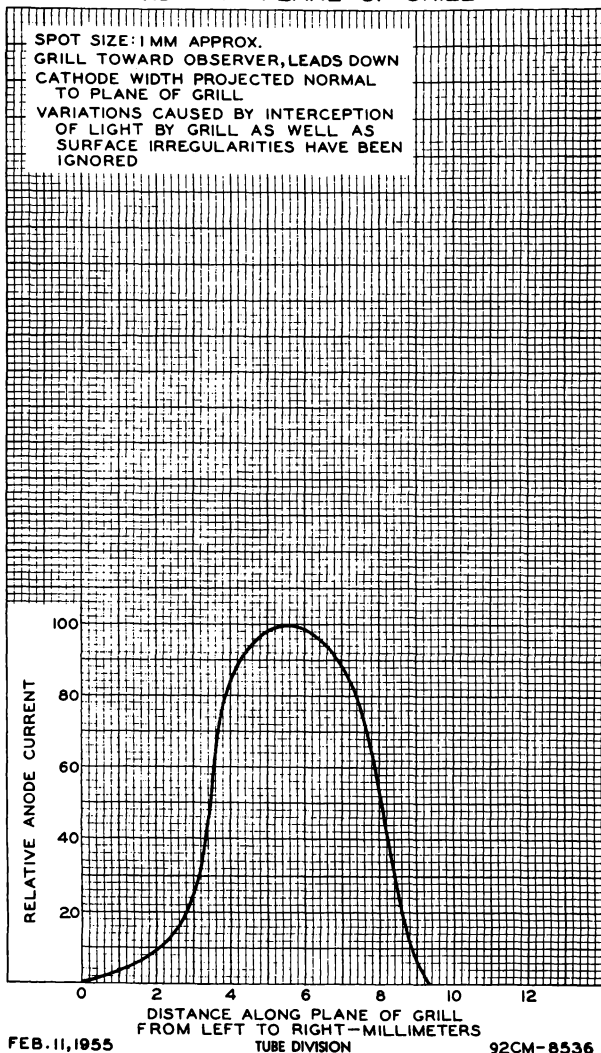


6472

6472

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL

SPOT SIZE: 1 MM APPROX.
GRILL TOWARD OBSERVER, LEADS DOWN
CATHODE WIDTH PROJECTED NORMAL
TO PLANE OF GRILL
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



FEB. 11, 1955

TUBE DIVISION

92CM-8536

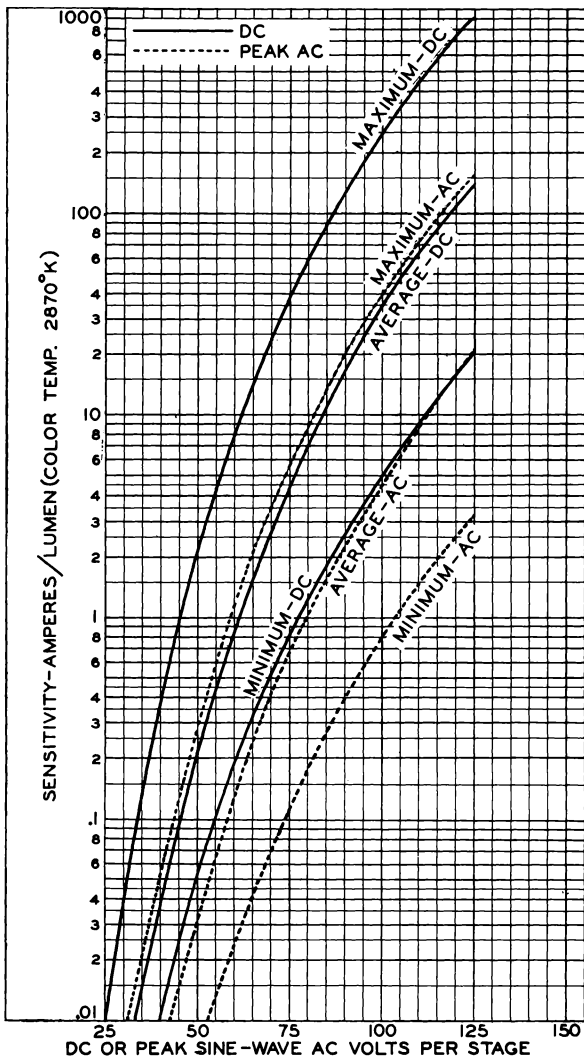
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6472



6472

RANGE OF LUMINOUS SENSITIVITY



JAN. 29, 1955

TUBE DIVISION

92CL-8027RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6570

VACUUM PHOTOTUBE

LOW-MICROPHONIC TYPE WITH S-I RESPONSE

DATA

General:

Wavelength of Maximum Response. 8000 ± 1000 angstroms

Cathode:

Shape Semicylindrical

Minimum projected length* 1-1/4"

Minimum projected width* 5/8"

Direct Interelectrode Capacitance $3 \mu\text{f}$

Overall Length. 4-5/16" ± 1/8"

Seated Length 3-11/16" ± 1/8"

Seated Length to Center of Cathode 2-1/8" $\pm$ 3/32"

Maximum Diameter. 1-1/8"

Mounting Position Any

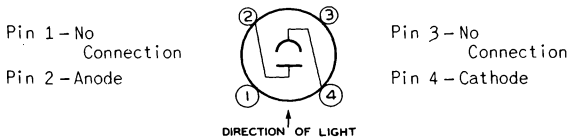
Weight (Approx.) 1.3 oz

Bulb. T-8

Base. Dwarf-Shell Small 4-Pin (JETEC No.A4-26),

Non-hygroscopic

BOTTOM VIEW



Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE

(DC or Peak AC) 500 max. volts

AVERAGE CATHODE-CURRENT DENSITY ^o . . .	25 max. μ amp/sq. in.
--	---------------------------

AVERAGE CATHODE CURRENT^o. 5 max. μ amp

AMBIENT TEMPERATURE	100 max.	°C
-------------------------------	----------	----

Characteristics at 250 Volts on Anode:

Min.	Av.	Max.
------	-----	------

Sensitivity:

Radiant at 8000 angstroms . . - 0.0027 - $\mu\text{amp}/\mu\text{watt}$

Luminous# 20 30 40 $\mu\text{amp/lumen}$

Sensitivity Difference Between

Highest Value and Lowest Value Along Cathode Length ^a	-	-	4.5	μamp/lumen
--	---	---	-----	------------

Anode Dark Current at 25°C.	-	-	0.013	μamp
-------------------------------------	---	---	-------	------

* On plane perpendicular to indicated direction of incident light.

○ Averaged over any interval of 30 seconds maximum.

* For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A dc anode supply of 250 volts, a 1-megohm load resistor, and a light input of 0.1 lumen are used.

▲ Measured under the same conditions as indicated under (#) with light input of 0.1 lumen and a light spot 1/2 inch in diameter.

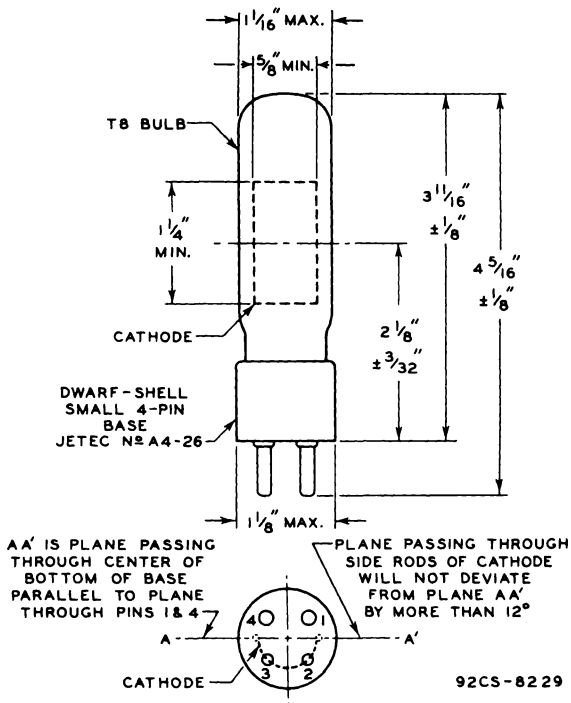
6570



6570

VACUUM PHOTOTUBE

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at the front of this Section

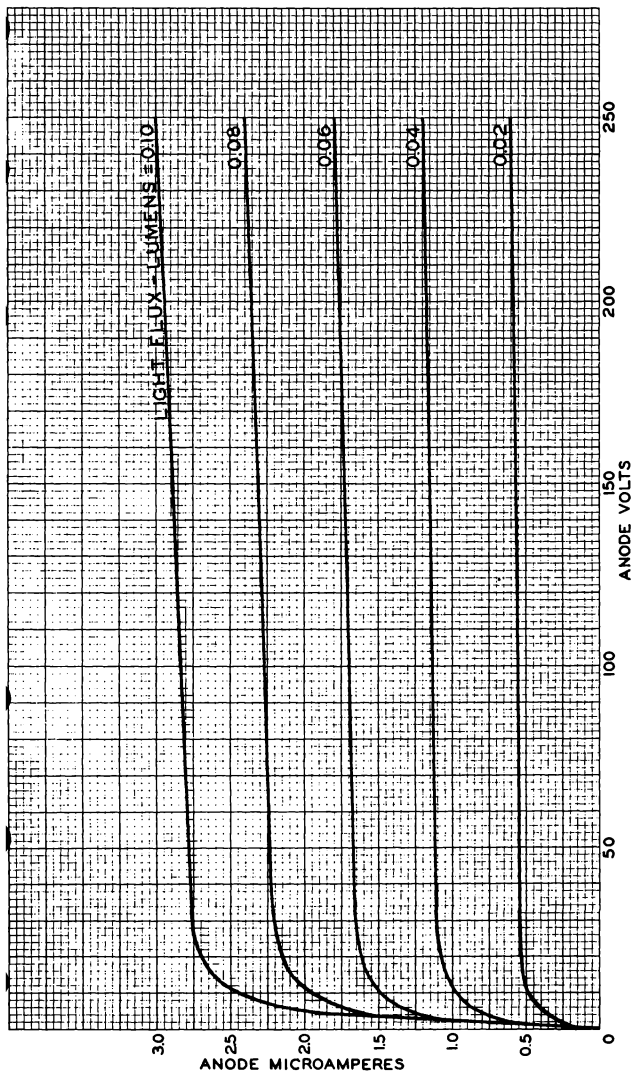




6570

6570

AVERAGE ANODE CHARACTERISTICS



DEC. 3, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8491



6655

6655

MULTIPLIER PHOTOTUBE10-STAGE, HEAD-ON TYPE WITH
1-11/16" SEMITRANSSPARENT CATHODE AND S-11 RESPONSE**DATA****General:**Spectral Response. S-11
Wavelength of Maximum Response 4400 ± 500 angstroms
Cathode, Semitransparent:

Shape. Circular

Window:

Area 2.2 sq. in.

Minimum diameter 1-11/16 in.

Index of refraction. 1.51

Direct Interelectrode Capacitances (Approx.):

Anode to dynode No.10. 4.4 μf Anode to all other electrodes. 7 μf

Maximum Overall Length 5-13/16"

Seated Length. $4-7/8" \pm 3/16"$

Maximum Diameter 2-5/16" ←

Mounting Position. Any

Weight (Approx.) 5.2 oz ←

Bulb T-16

Base Medium-Shell Diheptal 14-Pin (JETEC No.B14-38),
Non-hygroscopic

Basing Designation for BOTTOM VIEW 14AA ←

Pin 1—Dynode No.1

Pin 2—Dynode No.2

Pin 3—Dynode No.3

Pin 4—Dynode No.4

Pin 5—Dynode No.5

Pin 6—Dynode No.6

Pin 7—Dynode No.7

Pin 8—Dynode No.8

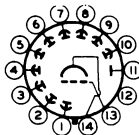
Pin 9—Dynode No.9

Pin 10—Dynode No.10

Pin 11—Anode

Pin 12—Internal
Connection—
Do Not UsePin 13—Focusing
Electrode

Pin 14—Cathode

DIRECTION OF LIGHT:
INTO END OF BULB**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC or Peak AC) 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.10

AND ANODE (DC or Peak AC). 250 max. volts ←

DYNODE-No.1 SUPPLY VOLTAGE

(DC or Peak AC). 300 max. volts

FOCUSING-ELECTRODE VOLTAGE

(DC or Peak AC). 300 max. volts

AVERAGE ANODE CURRENT • 0.75 max. ma

AMBIENT TEMPERATURE. 75 max. °C

• Averaged over any interval of 30 seconds maximum.

← Indicates a change.



MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1000 volts (except as noted) and

Focusing Electrode* connected to Dynode No. 1 at socket

	Min.	Median	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms . .	-	20000	-	$\mu\text{amp}/\mu\text{watt}$
Cathode radiant, at				
4400 angstroms . .	-	0.040	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: $\blacklozenge$				
At 0 cps	10	25	-	amp/lumen
With dynode No. 10				
as output elec-				
trode**	-	15	-	amp/lumen
Cathode luminous:				
With tungsten				
light source $\blacktriangle$. .	40	50	-	$\mu\text{amp}/\text{lumen}$
With blue light				
source $\blacklozenge$	0.04	-	-	μamp
Current Amplification.	-	500000	-	
Equivalent Anode-Dark-				
Current Input $\blacksquare$. .	-	8.5×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input $\star$	-	7×10^{-12}	-	lumen
Dark Current to Any				
Electrode Except				
Anode (At 25°C) . .	-	-	0.75	μamp

With E = 750 volts (except as noted) and

Focusing Electrode* connected to Dynode No. 1 at socket

	Min.	Median	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms . .	-	2000	-	$\mu\text{amp}/\mu\text{watt}$
Cathode radiant, at				
4400 angstroms . .	-	0.040	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: $\blacklozenge$				
At 0 cps	-	2.5	-	amp/lumen
Cathode luminous:				
With tungsten				
light source $\blacktriangle$. .	40	50	-	$\mu\text{amp}/\text{lumen}$
With blue light				
source $\blacklozenge$	0.04	-	-	μamp
Current Amplification.	-	50000	-	

$\blacklozenge$ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

* , ** , $\blacktriangle$, $\blacklozenge$, $\blacksquare$: See next page.

$\rightarrow$ Indicates a change.



6655

6655

MULTIPLIER PHOTOTUBE

- * In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.
- ** An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as collector.
- ▲ For conditions the same as shown under (♣) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.
- ⊕ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.
- ♣ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.
- ⊕ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- ★ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 6655 is dependent on the magnitude of the anode current and its duration. When the 6655 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6655 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.75 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or magnetic shielding of the 6655 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section

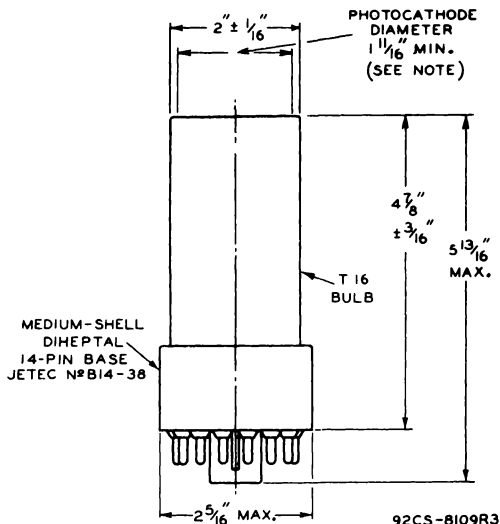
← Indicates a change.

6655



6655

MULTIPLIER PHOTOTUBE



☐ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

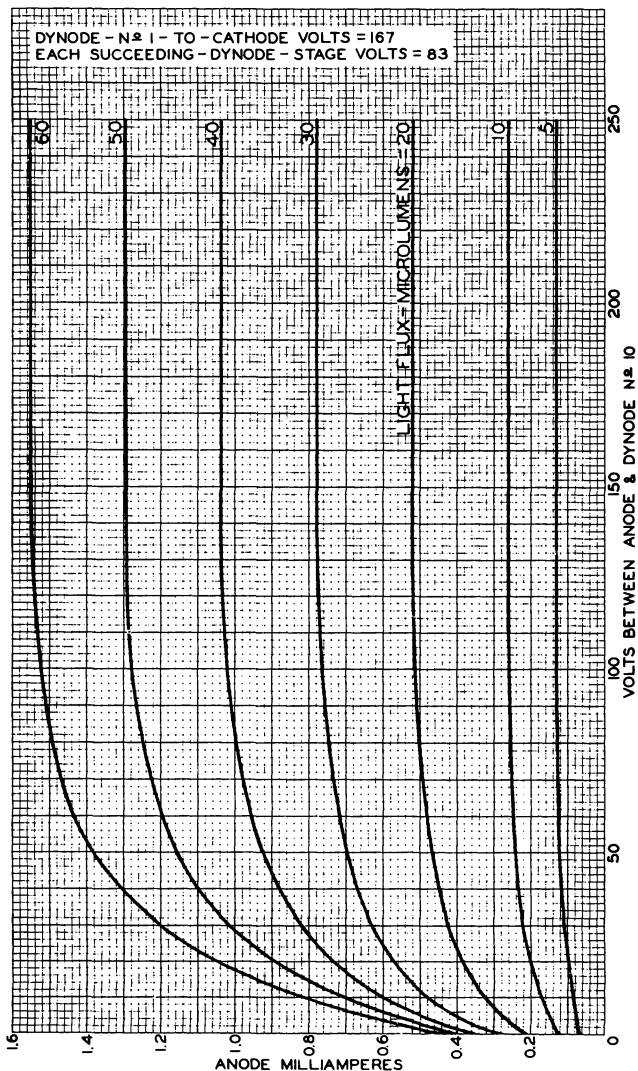
NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLATNESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.



6655

6655

AVERAGE ANODE CHARACTERISTICS



APRIL 20, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

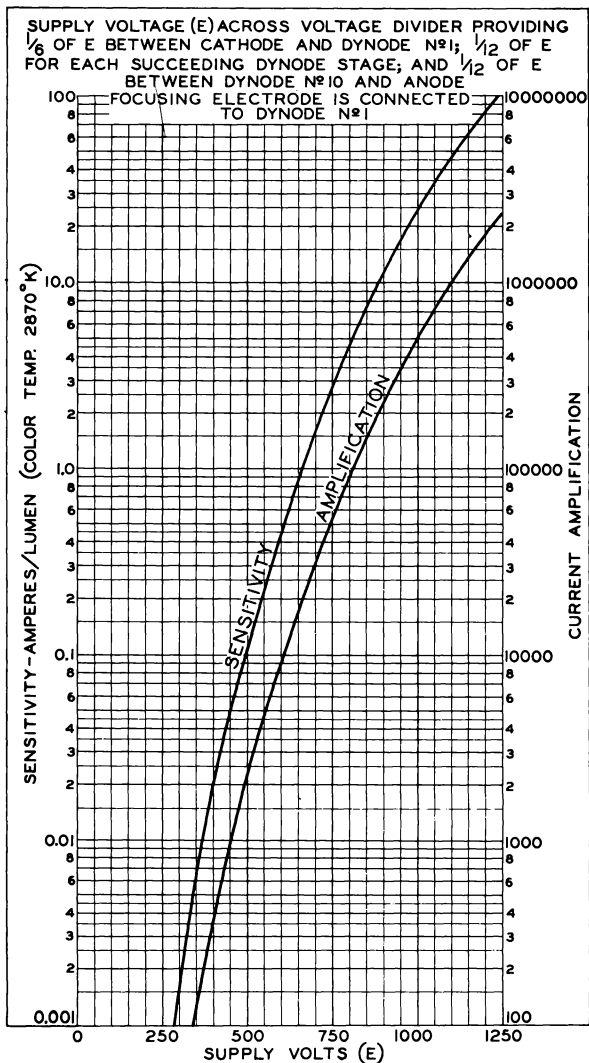
92CM-8603

6655



6655

AVERAGE CHARACTERISTICS



MAY 27, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

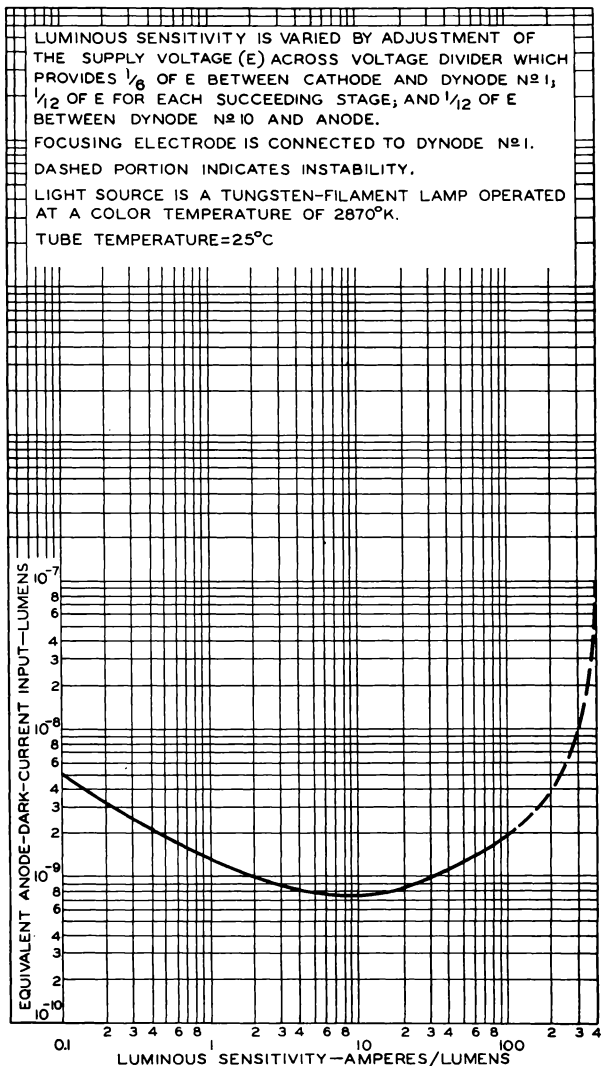
92CL-8638



6655

6655

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



MAY 27, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8636

6655



6655

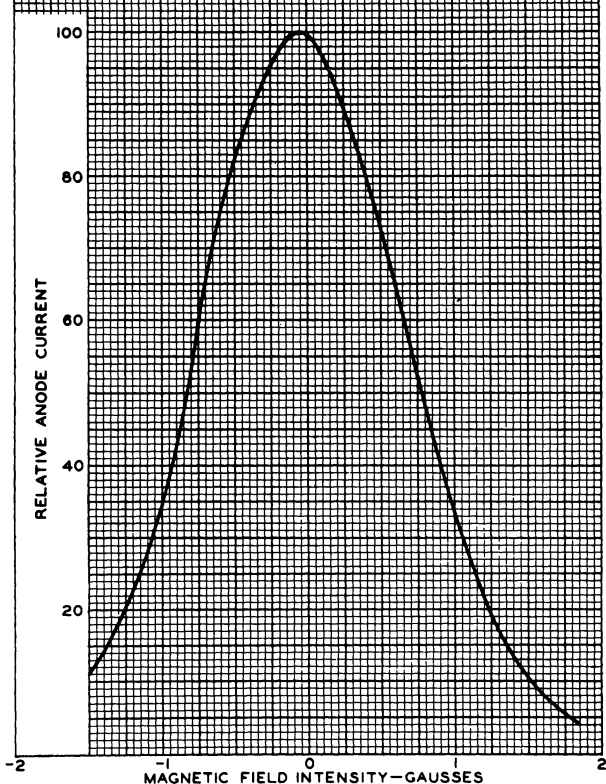
EFFECT OF MAGNETIC FIELD ON ANODE CURRENT

MAGNETIC FIELD IS PARALLEL TO DYNODE-CAGE AXIS.
POSITIVE VALUES ARE FOR LINES OF FORCE FROM LEFT
TO RIGHT WITH BASE DOWN AND BASE KEY TOWARD
OBSERVER.

DYNODE-N₂-TO-CATHODE VOLTS=150

EACH-SUCCESSING-STAGE VOLTS=100

FOCUSING ELECTRODE IS CONNECTED TO DYNODE N₂



MAY 7, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8136R1



6810

6810

MULTIPLIER PHOTOTUBE

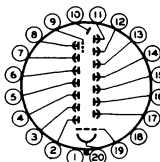
14-STAGE, HEAD-ON TYPE WITH
1-11/16" SEMITRANSSPARENT CATHODE AND S-11 RESPONSE
SHORT TIME-RESOLUTION CAPABILITY

DATA**General:**

Spectral Response S-11
Wavelength of Maximum Response 4400 $\pm$ 500 angstroms
Cathode, Semitransparent:
Shape Circular
Window:
Area 2.2 sq. in.
Minimum diameter. 1-11/16 in.
Index of refraction 1.51
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.14 2.4 μf
Anode to all other electrodes 5.5 μf
Dynode No.14 to all other electrodes. 7.5 μf
Maximum Overall Length 7-1/2"
Seated Length 6-11/16" $\pm$ 3/16"
Maximum Diameter. 2-3/8"
Mounting Position Any
Weight (Approx.). 8 oz
Bulb. T-16
Base. Small-Shell Bidecal 20-Pin (JETEC No.B20-102),
Non-hygroscopic

Basing Designation for BOTTOM VIEW. 20B

Pin 1—No Connection	Pin 11—Dynode No.14
Pin 2—Dynode No.1	Pin 12—Dynode No.12
Pin 3—Dynode No.3	Pin 13—Dynode No.10
Pin 4—Dynode No.5	Pin 14—Dynode No.8
Pin 5—Dynode No.7	Pin 15—Dynode No.6
Pin 6—Dynode No.9	Pin 16—Dynode No.4
Pin 7—Dynode No.11	Pin 17—Dynode No.2
Pin 8—Dynode No.13	Pin 18—No Connection
Pin 9—Grid No.2 (Accelerating Electrode)	Pin 19—Grid No.1 (Focusing Electrode)
Pin 10—Anode	Pin 20—Photocathode

**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC) 2300 max. volts
SUPPLY VOLTAGE BETWEEN DYNODE No.14
AND ANODE (DC). 400 max. volts
SUPPLY VOLTAGE BETWEEN ACCELERATING-
ELECTRODE AND DYNODE No.13 (DC) $\pm$ 500 max. volts
DYNODE-No.1 SUPPLY VOLTAGE (DC) 400 max. volts
FOCUSING-ELECTRODE SUPPLY VOLTAGE (DC). 400 max. volts
AVERAGE ANODE CURRENT* 2 max. ma
AMBIENT TEMPERATURE 75 max. $^{\circ}\text{C}$

* Averaged over any interval of 30 seconds maximum.



MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across a voltage divider providing electrode voltages shown in Table 1

With $E = 2000$ volts (except as noted) and Accelerating-Electrode Voltage adjusted to give maximum gain

	Min.	Median	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms.	-	0.6	-	amp/ μ watt
Cathode radiant;				
at 4400 angstroms . . .	-	0.048	-	μ amp/ μ watt
Luminous:†				
At 0 cps.	120	750	4500	amp/lumen
With dynode No.14				
as output				
electrode†.	-	525	-	amp/lumen
Cathode luminous:				
With tungsten				
light source^	40	60	-	μ amp/lumen
With blue light				
source⊙.	0.04	-	-	μ amp
Current Amplification . . .	-	12.5×10^6	-	
Equivalent Anode-Dark-				
Current Input‡	-	5×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input★ . .	-	6×10^{-12}	-	lumen
Dark Current to Any				
Electrode Except				
Anode (At 25°C).	-	-	0.75	μ amp

With $E = 2300$ volts (except as noted) and Accelerating-Electrode Voltage adjusted to give maximum gain

	Min.	Median	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms.	-	3.2	-	amp/ μ watt
Cathode radiant,				
at 4400 angstroms	-	0.048	-	μ amp/ μ watt
Luminous:†				
At 0 cps.	660	4000	28000	amp/lumen
With dynode No.14				
as output				
electrode†.	-	2800	-	amp/lumen
Cathode luminous:				
With tungsten				
light source^	40	60	-	μ amp/lumen
With blue light				
source⊙.	0.04	-	-	μ amp
Current Amplification . . .	-	66×10^6	-	

†, ‡, ^, ⊙, ⊕, ⊖, ★: See next page.



6810

6810

MULTIPLIER PHOTOTUBE

TABLE I

VOLTAGE TO BE PROVIDED BY DIVIDER

Between	5.4% of Supply Voltage (E) multiplied by
Cathode and Focusing Electrode	1
Focusing Electrode and Dynode No.1	1
Dynode No.1 and Dynode No.2	1
Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9	1
Dynode No.9 and Dynode No.10	1
Dynode No.10 and Dynode No.11	1
Dynode No.11 and Dynode No.12	1.25
Dynode No.12 and Dynode No.13	1.5
Dynode No.13 and Dynode No.14	1.75
Dynode No.14 and Anode	2
Anode and Cathode	18.5

• For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 0.1 microlumen is used. The load resistor has a value of 0.01 megohm.

† An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.14 as the output electrode. With this arrangement, the load is connected in the dynode-No.14 circuit and the anode serves only as collector. The value of sensitivity at dynode No.14 is approximately 70% of that when the anode is the output electrode. Specifically, the sensitivity measured at dynode No.14 is equal to $(1-1/g)$ times the sensitivity measured at the anode, where "g" is the gain of the dynode-No.14 stage.

▲ For conditions the same as shown under (•) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.

● Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.

◆ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

⊛ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 2000 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerator.

■ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 2000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 2000 volts, 25°C tube temperature, external shield potential of -2000 volts, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.



MULTIPLIER PHOTOTUBE

OPERATING CONSIDERATIONS

The *operating stability* of the 6810 is dependent on the magnitude of the anode current and its duration. When the 6810 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6810 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or magnetic shielding of the 6810 may be necessary.

The *material* of which the dynodes of the 6810 are made has stable, high-current carrying capabilities and permits the use of a tube manufacturing process which minimizes regenerative effects such as afterpulses. The relative freedom of the 6810 from afterpulses and its small spread in electron transit time make it particularly useful for fast coincidence scintillation counting.

Because the 6810 offers the advantage of small spread in electron transit time, it has a fast pulse rise time. As a result, the 6810 has very short time-resolution capability, i.e., in the order of 1 or 2 millimicroseconds. For an input pulse having a duration of 1 millimicrosecond or less, the time spread of the pulse at the anode is about 9 millimicroseconds measured at 50 per cent of the maximum pulse height, when the supply voltage is 2000 volts and the focusing electrode is connected to dynode No.1.

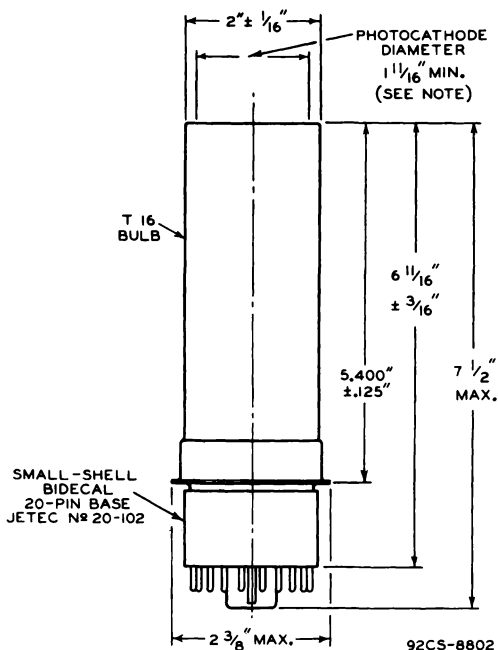
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section



6810

6810

MULTIPLIER PHOTOTUBE



☐ OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM THE PERPENDICULAR
ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLAT-
NESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

6810



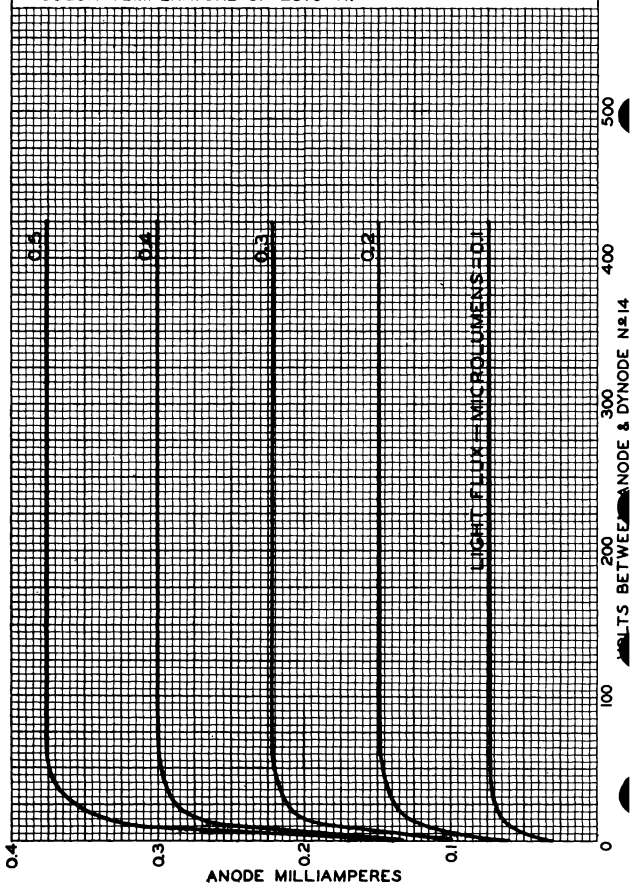
6810

AVERAGE ANODE CHARACTERISTICS

CATHODE-TO-GRID-N#1 VOLTS = 108

GRID-N#1-TO-DYNODE N#1 (DY₁) VOLTS = 108

DY₁ - TO - DY₂ }
 DY₂ - TO - DY₃ } VOLTS = 108
 ETC. TO }
 DY₁₀ - TO - DY₁₁ }

DY₁₁ - TO - DY₁₂ VOLTS = 135DY₁₂ - TO - DY₁₃ VOLTS = 160DY₁₃ - TO - DY₁₄ VOLTS = 189GRID-N#2 VOLTS ADJUSTED TO
GIVE MAX. GAINLIGHT SOURCE IS TUNGSTEN FILAMENT LAMP OPERATED AT A
COLOR TEMPERATURE OF 2870°K.

ANODE MILLIAMPERES

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8846



6810

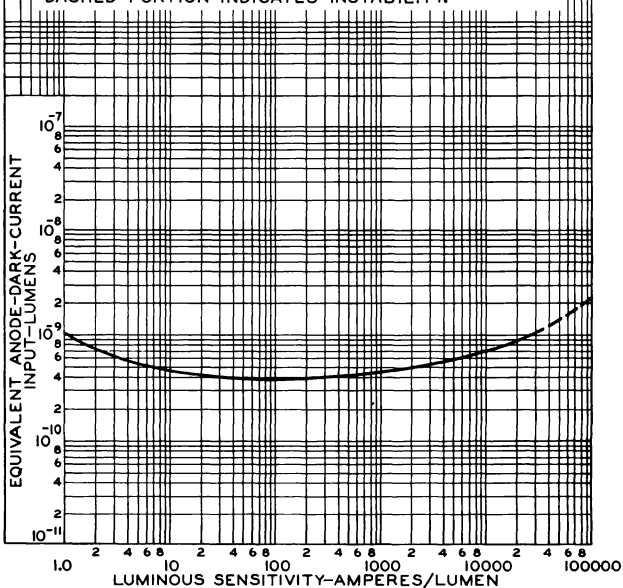
6810

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

LUMINOUS SENSITIVITY IS VARIED BY ADJUSTMENT OF THE SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER WHICH PROVIDES VOLTAGES AS FOLLOWS:

BETWEEN	5.4% OF E MULTIPLIED BY
CATHODE & GRID N ^o 1	
GRID N ^o 1 & DYNODE N ^o 1 (DY ₁)	
DY ₁ & DY ₂	
DY ₂ & DY ₃	
DY ₃ & DY ₄	
DY ₄ & DY ₅	
DY ₅ & DY ₆	
DY ₆ & DY ₇	
DY ₇ & DY ₈	
DY ₈ & DY ₉	
DY ₉ & DY ₁₀	
DY ₁₀ & DY ₁₁	
DY ₁₁ & DY ₁₂	1.25
DY ₁₂ & DY ₁₃	1.50
DY ₁₃ & DY ₁₄	1.75
DY ₁₄ & ANODE	2.
ANODE & CATHODE	18.5

GRID-N^o2 VOLTS ADJUSTED TO GIVE MAX. GAIN.
 LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP OPER-
 ATED AT A COLOR TEMPERATURE OF 2870°K.
 TUBE TEMPERATURE=25°C
 DASHED PORTION INDICATES INSTABILITY.



TUBE DIVISION

92CM-8848

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

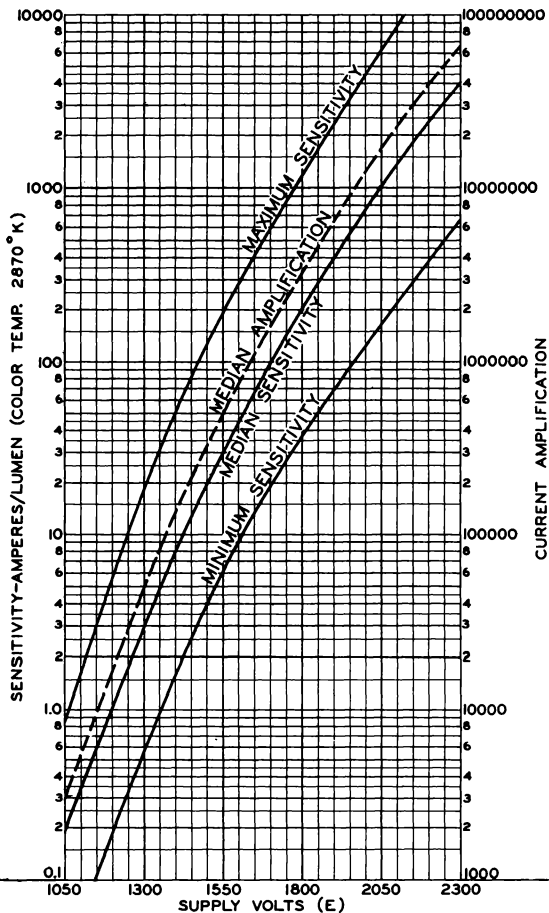
6810



6810

CHARACTERISTICS

CATHODE-TO-GRID-N₂ VOLTS=108
 GRID-N₂1-TO-DYNODE-N₂1 (DY₁) VOLTS=108
 DY₁-TO-DY₂
 DY₂-TO-DY₃
 ETC. TO
 DY₁₀-TO-DY₁₁ } VOLTS=108
 DY₁₁-TO-DY₁₂ VOLTS=135
 DY₁₂-TO-DY₁₃ VOLTS=160
 DY₁₃-TO-DY₁₄ VOLTS=189
 DY₁₄-TO-ANODE VOLTS=216
 GRID-N₂2 VOLTS ADJUSTED
 TO GIVE MAX. GAIN





6903

6903

MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH

1-5/8" SEMI-TRANSPARENT CATHODE AND S-13 RESPONSE

DATA**General:**

Spectral Response S-13

Wavelength of Maximum Response. 4400 $\pm$ 500 angstroms

Cathode, Semitransparent:

Shape Circular

Window:

Area 2.0 sq. in.

Minimum diameter. 1-5/8 in.

Index of refraction at 2000 angstroms 1.51

Direct Interelectrode Capacitances (Approx.):

Anode to dynode No.10 4.4 μf Anode to all other electrodes 7 μf

Maximum Overall Length. 6-9/16"

Seated Length 5-5/8" $\pm$ 3/16"

Maximum Diameter. 2-5/16"

Mounting Position Any

Weight (Approx.). 7 oz

Bulb. T-16

Faceplate Fused Silica

Maximum thickness 0.150"

Base. Medium-Shell Diheptal 14-Pin (JETEC No.514-38)

Non-hygroscopic

Basing Designation for BOTTOM VIEW 14AA

Pin 1 - Dynode No.1

Pin 2 - Dynode No.2

Pin 3 - Dynode No.3

Pin 4 - Dynode No.4

Pin 5 - Dynode No.5

Pin 6 - Dynode No.6

Pin 7 - Dynode No.7

Pin 8 - Dynode No.8

Pin 9 - Dynode No.9

Pin 10 - Dynode No.10

Pin 11 - Anode

Pin 12 - Internal

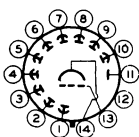
Connection-

Do Not Use

Pin 13 - Focusing

Electrode

Pin 14 - Cathode

DIRECTION OF LIGHT:
INTO END OF BULB**Maximum Ratings, Absolute Values:**

ANODE-SUPPLY VOLTAGE (DC or Peak AC). 1250 max. volts

SUPPLY VOLTAGE BETWEEN DYNODE No.10

AND ANODE (DC or Peak AC) 250 max. volts

DYNODE-No.1 SUPPLY VOLTAGE

(DC or Peak AC) 300 max. volts

FOCUSING-ELECTRODE VOLTAGE

(DC or Peak AC) 300 max. volts

AVERAGE ANODE CURRENT* 0.75 max. ma

AMBIENT TEMPERATURE 75 max. $^{\circ}\text{C}$

* Averaged over any interval of 30 seconds maximum.



6903

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1000 volts (except as noted) and

Focusing Electrode* connected to Dynode No. 1 at socket

	Min.	Median	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms . .	-	19000	-	$\mu\text{amp}/\mu\text{watt}$
Cathode radiant, at				
4400 angstroms . .	-	0.047	-	$\mu\text{amp}/\mu\text{watt}$
Luminous:♦				
At 0 cps	8	24	240	amp/lumen
With dynode No. 10				
as output elec-				
trode**	-	14	-	amp/lumen
Cathode luminous:				
With tungsten				
light source▲ . .	40	60	-	$\mu\text{amp}/\text{lumen}$
With blue light				
source◆	0.04	-	-	μamp
Current Amplification.	-	400000	-	
Equivalent Anode-Dark-				
Current Input‡ . . .	-	1×10^{-9}	3×10^{-9}	lumen
Equivalent Noise Input:				
Luminous★	-	6.7×10^{-12}	-	lumen
Ultraviolet†	-	1.6×10^{-14}	-	watt
Dark Current to Any				
Electrode Except				
Anode (At 25°C) . .	-	-	0.75	μamp

With E = 750 volts (except as noted) and

Focusing Electrode* connected to Dynode No. 1 at socket

	Min.	Median	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms . .	-	1650	-	$\mu\text{amp}/\mu\text{watt}$
Cathode radiant, at				
4400 angstroms . .	-	0.047	-	$\mu\text{amp}/\mu\text{watt}$
Luminous:♦				
At 0 cps	-	2.1	-	amp/lumen
With dynode No. 10				
as output elec-				
trode**	-	1	-	amp/lumen

♦ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

*, **, ▲, ◆, ‡, ★, †: See next page.



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MULTIPLIER PHOTOTUBE

	Min.	Median	Max.	
Cathode luminous:				
With tungsten				
light source [▲] . .	40	60	-	$\mu\text{amp/lumen}$
With blue light				
source [⬢]	0.04	-	-	μamp
Current Amplification.	-	35000	-	

* In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.

** An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as collector.

▲ For conditions the same as shown under (♣) except that the value of light flux is 0.01 lumen and 150 volts are applied between cathode and all other electrodes connected together as anode.

♣ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

⬢ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

⊗ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

■ For maximum signal-to-noise ratio operation with a supply voltage (E) below 1000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

† Determined under the same conditions as shown under (★) except that use is made of monochromatic source having radiation of 2537 angstroms.

OPERATING CONSIDERATIONS

The *operating stability* of the 6903 is dependent on the magnitude of the anode current and its duration. When the 6903 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6903 usually recovers a substantial percentage of such loss in sensitivity.

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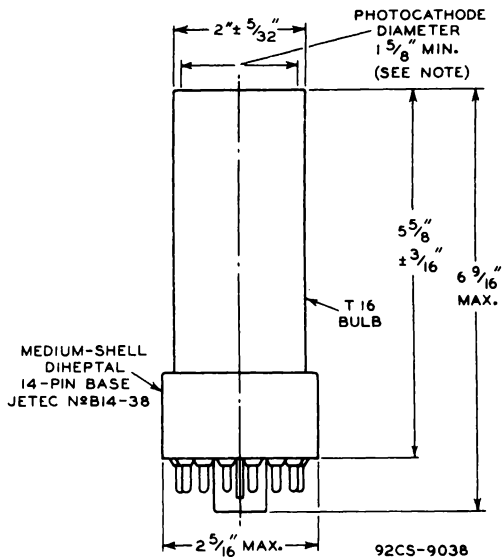
6903

MULTIPLIER PHOTOTUBE

The use of an average anode current well below the maximum rated value of 0.75 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or magnetic shielding of the 6903 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-13 Response
is shown at the front of this Section



☐ OF BULB WILL NOT DEVIATE MORE THAN 3°
IN ANY DIRECTION FROM THE PERPENDICULAR
ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

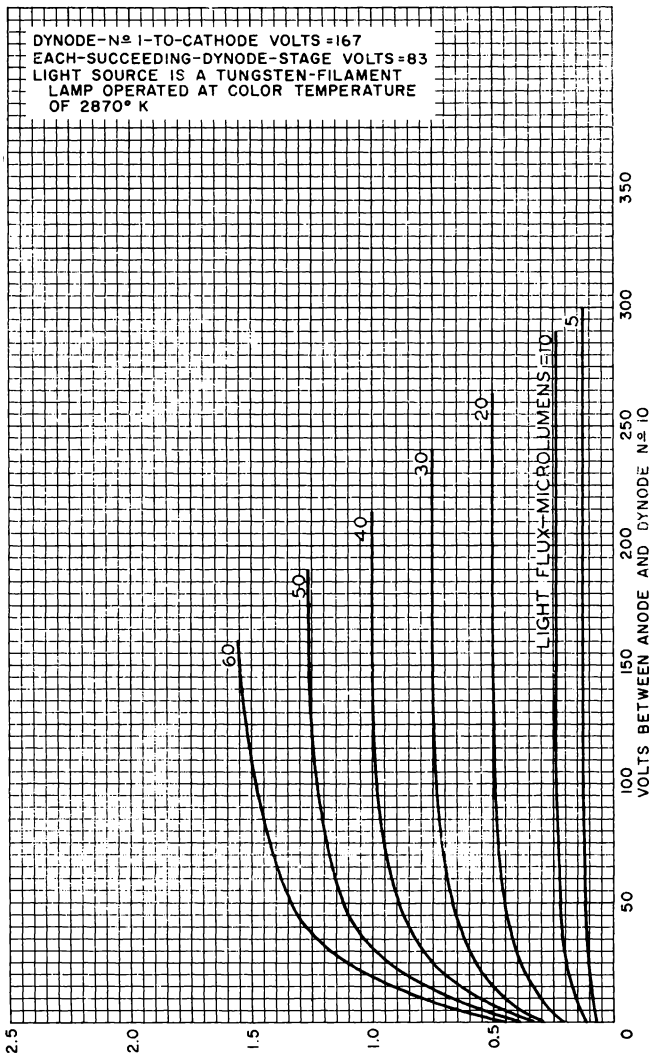
NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLATNESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.



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6903

AVERAGE ANODE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9039



TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

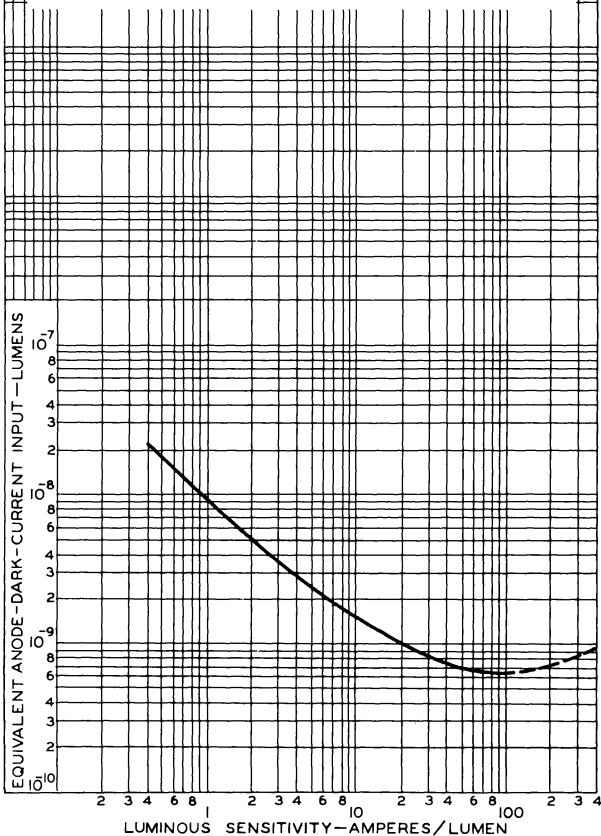
LUMINOUS SENSITIVITY IS VARIED BY ADJUSTMENT OF THE SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER WHICH PROVIDES $\frac{1}{6}$ OF E BETWEEN CATHODE AND DYNODE NO. 1; $\frac{1}{12}$ OF E FOR EACH SUCCEEDING STAGE; AND $\frac{1}{12}$ OF E BETWEEN DYNODE NO. 10 AND ANODE.

FOCUSING ELECTRODE IS CONNECTED TO DYNODE NO. 1.

DASHED PORTION INDICATES INSTABILITY.

LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP OPERATED AT A COLOR TEMPERATURE OF 2870°K.

TUBE TEMPERATURE = 25°C



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9032



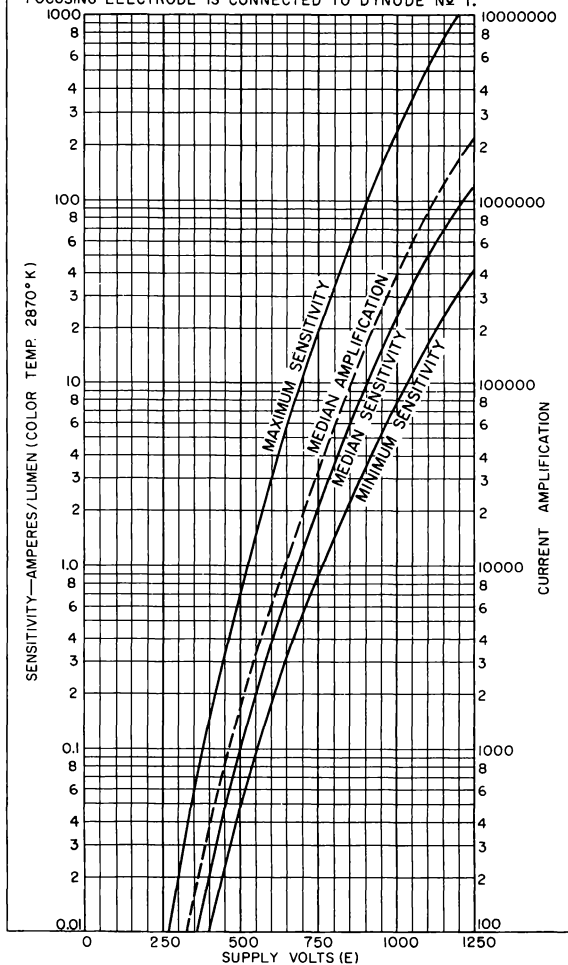
6903

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CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING $1/6$ OF E BETWEEN CATHODE AND DYNODE N $\circ$ 1; $1/12$ OF E FOR EACH SUCCEEDING DYNODE STAGE; AND $1/12$ OF E BETWEEN DYNODE N $\circ$ 10 AND ANODE.

FOCUSING ELECTRODE IS CONNECTED TO DYNODE N $\circ$ 1.



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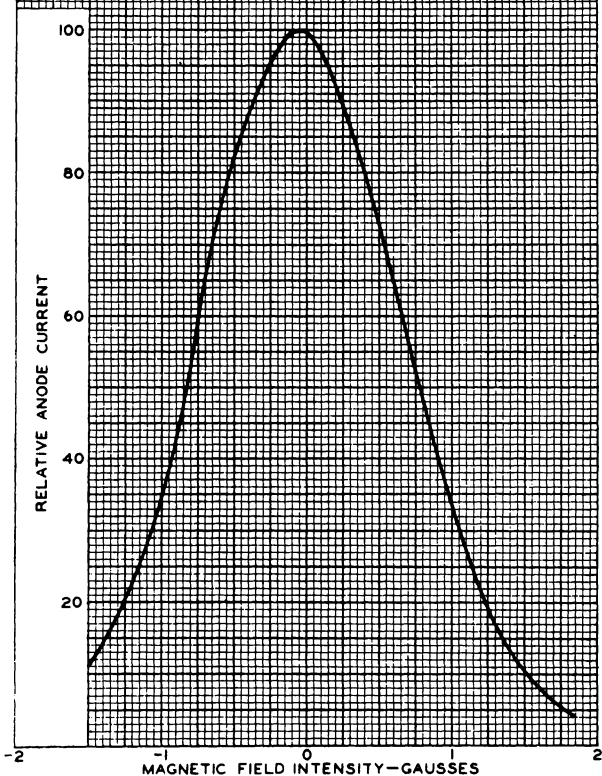
EFFECT OF MAGNETIC FIELD ON ANODE CURRENT

MAGNETIC FIELD IS PARALLEL TO DYNODE-CAGE AXIS.
POSITIVE VALUES ARE FOR LINES OF FORCE FROM LEFT
TO RIGHT WITH BASE DOWN AND BASE KEY TOWARD
OBSERVER.

DYNODE-N^o1-TO-CATHODE VOLTS=150

EACH-SUCCESSING-STAGE VOLTS=100

FOCUSING ELECTRODE IS CONNECTED TO DYNODE N^o1.





7038

VIDICON

600-LINE RESOLUTION

For film and live pickup

with color or black-and-white TV cameras

7038

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 $\pm$ 10% . . . ac or dc volts

Current. 0.6 amp

Direct Interelectrode Capacitance: ↓

Target to all

other electrodes 4.6 μ f

Spectral Response. See Curves

Photoconductive Layer:

Maximum useful diagonal of rectangular

image (4 x 3 aspect ratio) 0.62"

Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer.

Focusing Method. Magnetic

Deflection Method. Magnetic

Overall Length 6.25" $\pm$ 0.25"Greatest Diameter. 1.125" $\pm$ 0.010"

Weight (Approx.) 2 oz

Operating Position Any ←

Bulb T8

Base Connector Cinch No.54A18088, or equivalent

Base Small-Button Ditetra 8-Pin (JEDEC No.E8-11)

Basing Designation for BOTTOM VIEW 8HM

Pin 1—Heater

Pin 2—Grid No.1

Pin 3—Internal

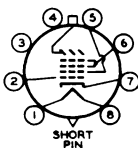
Connection—
Do Not Use

Pin 4—Same as Pin 3

Pin 5—Grid No.2

Pin 6—Grid No.4,

Grid No.3



DIRECTION OF LIGHT:
INTO FACE END OF TUBE

Pin 7—Cathode

Pin 8—Heater

Flange—Target

Short Index Pin -

Same as

Pin 3

Maximum Ratings, Absolute Values:

For scanned area of 1/2" x 3/8"

GRID-No.3 & GRID-No.4 VOLTAGE. 350 max. volts

GRID-No.2 VOLTAGE. 350 max. volts

GRID-No.1 VOLTAGE:

Negative-bias value. 125 max. volts

Positive-bias value. 0 max. volts

↓: See next page.

←Indicates a change.



VIDICON

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode.	125 max.	volts
--	----------	-------

Heater positive with respect to cathode.	10 max.	volts
--	---------	-------

DARK CURRENT	0.25 max.	μ a
------------------------	-----------	---------

PEAK TARGET CURRENT	0.55 max.	μ a
-------------------------------	-----------	---------

FACEPLATE:

Illumination	1000 max.	ft-c
------------------------	-----------	------

Temperature	60 max.	$^{\circ}$ C
-----------------------	---------	--------------

Typical Operation:

*For scanned area of 1/2" x 3/8" and
faceplate temperature of 30 $^{\circ}$ to 35 $^{\circ}$ C*

Grid-No.4 (Decelerator) & Grid-No.3		
-------------------------------------	--	--

(Beam-Focus Electrode*) Voltage. .	250 $^{\square}$ to 300	volts
------------------------------------	-------------------------	-------

Grid-No.2 (Accelerator) Voltage. . .	300	volts
--------------------------------------	-----	-------

Grid-No.1 Voltage for picture cutoff $\bullet$	-45 to -100	volts
---	-------------	-------

Average "Gamma" of Transfer Charac- teristic for signal-output current between 0.02 μ a and 0.2 μ a	0.65	
---	------	--

Visual Equivalent Signal-to-Noise Ratio (Approx.) $^{\circ}$	300:1	
---	-------	--

Minimum Peak-to-Peak Blanking Voltage:		
---	--	--

When applied to grid No.1.	75	volts
------------------------------------	----	-------

When applied to cathode.	20	volts
----------------------------------	----	-------

Field Strength at Center of Focusing Coil (Approx.)	40	gausses
--	----	---------

Field Strength of Adjustable Alignment Coil $\bullet$	0 to 4	gausses
--	--------	---------

Maximum-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight) .	2	ft-c
--------------------------------------	---	------

Maximum Target Voltage required to produce dark current of 0.2 μ a in any tube**	110	volts
--	-----	-------

Target Voltage $\dagger$	60 to 100	volts
------------------------------------	-----------	-------

Dark Current Δ	0.2	μ a
---------------------------------	-----	---------

Target Current (Highlight) $\blacksquare$	0.4 to 0.5	μ a
---	------------	---------

Signal-Output Current: $\#$		
-----------------------------	--	--

Peak	0.2 to 0.3	μ a
----------------	------------	---------

Average.	0.08 to 0.1	μ a
------------------	-------------	---------

Average-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight) .	15	ft-c
--------------------------------------	----	------

Maximum Target Voltage required to produce dark current of 0.02 μ a in any tube**	60	volts
---	----	-------

Target Voltage $\dagger$	30 to 50	volts
------------------------------------	----------	-------

Dark Current	0.02	μ a
------------------------	------	---------

Target Current (Highlight) $\blacksquare$	0.3 to 0.4	μ a
---	------------	---------

$\bullet$, $\ast$, $\square$, $\circ$, $\bullet$, $\ast$, $\dagger$, Δ , $\blacksquare$, $\#$: See next page.



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VIDICON

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Signal-Output Current:*

Peak.	0.3 to 0.4	μ a
Average	0.1 to 0.2	μ a

Minimum-Lag Operation for Film Pickup

Faceplate Illumination (Highlight).	100	ft-c
Maximum Target Voltage required to produce dark current of 0.004 μ a in any tube**	30	volts
Target Voltage†	15 to 25	volts
Dark Current.	0.004	μ a
Target Current (Highlight)■	0.3 to 0.4	μ a
Signal-Output Current:*		
Peak.	0.3 to 0.4	μ a
Average	0.1 to 0.2	μ a

• This capacitance, which effectively is the output impedance of the 7038, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

* Beam focus is obtained by combined effect of grid-No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gauss.

□ Definition, focus uniformity, and picture quality decrease with decreasing grid-No.4 and grid-No.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.

• With no blanking voltage on grid No.1.

○ Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

• The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.

** The target voltage for each 7038 must be adjusted to that value which gives the desired operating dark current.

† Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.

▲ The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.

■ Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.

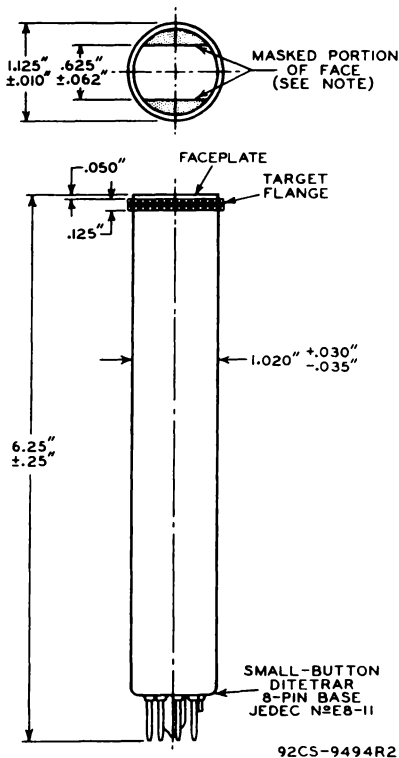
* Defined as the component of the target current after the dark-current component has been subtracted.

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VIDICON



NOTE: STRAIGHT SIDES OF MASKED PORTIONS ARE PARALLEL TO THE PLANE PASSING THROUGH TUBE AXIS AND SHORT INDEX PIN.



7263 VIDICON

7263

LOW-POWER (0.6-WATT) HEATER 600-LINE RESOLUTION

For use under severe shock and vibration, high humidity, and altitudes up to 50,000 feet in small, compact, transistorized TV cameras

DATA

General:

Heater, for Unipotential Cathode:

Voltage. 6.3 $\pm$ 10% ac or dc volts

Current. 0.095 amp

Direct Interelectrode Capacitance:†

Target to all other electrodes 4.6 μ f

Spectral Response. See Curves

Photoconductive Layer:

Maximum useful diagonal of rectangular image (4 x 3 aspect ratio). 0.62"

Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.

Focusing Method. Magnetic

Deflection Method. Magnetic

Overall Length 5.12" $\pm$ 0.06"

Greatest Diameter. 1.125" $\pm$ 0.010"

Weight (Approx.) 2 oz

Operating Position Any

Bulb T8

Base Connector Cinch No.54A18088, or equivalent

Base Small-Button Ditetra 8-Pin (JEDEC No.E8-11)

Basing Designation for BOTTOM VIEW 8HM

Pin 1—Heater

Pin 2—Grid No.1

Pin 3—Internal

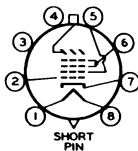
Connection—
Do Not Use

Pin 4—Same as Pin 3

Pin 5—Grid No.2

Pin 6—Grid No.4,

Grid No.3



Pin 7—Cathode

Pin 8—Heater

Flange—Target

Short Index Pin—

Same as

Pin 3

DIRECTION OF LIGHT:
INTO FACE END OF TUBE

Maximum Ratings, Absolute-Maximum Values:

For altitudes up to 50,000 feet and scanned area of 1/2" x 3/8"

GRID-No.3 & GRID-No.4 VOLTAGE. 350 max. volts

GRID-No.2 VOLTAGE. 350 max. volts

GRID-No.1 VOLTAGE:

Negative-bias value. 125 max. volts

Positive-bias value. 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode . . 125 max. volts

Heater positive with respect to cathode . . 10 max. volts

†: See next page.

7263



7263

VIDICON

DARK CURRENT.	0.25 max.	μ a
PEAK TARGET CURRENT	0.55 max.	μ a
FACEPLATE:		
Illumination.	1000 max.	ft-c
Temperature (Operating or storage).	60 max.	$^{\circ}$ C

Typical Operation:

*For scanned area of 1/2" x 3/8" and
faceplate temperature of 30 $^{\circ}$ to 35 $^{\circ}$ C*

Grid-No.4 (Decelerator) & Grid-No.3 (Beam-Focus- Electrode*) Voltage	250 $^{\square}$ to 300	volts
Grid-No.2 (Accelerator) Voltage	300	volts
Grid-No.1 Voltage for picture cutoff*	-45 to -100	volts
Average "Gamma" of Transfer Characteristic for signal- output current between 0.02 μ a and 0.2 μ a.	0.65	
Visual Equivalent Signal-to- Noise Ratio (Approx.) $^{\circ}$	300:1	
Minimum Peak-to-Peak Blanking Voltage:		
When applied to grid No.1	75	volts
When applied to cathode	20	volts
Field Strength at Center of Focusing Coil (Approx.)	40	gausses
Field Strength of Adjustable Alignment Coil $^{\circ}$	0 to 4	gausses

Maximum-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight).	2	ft-c
Maximum Target Voltage required to produce dark current of 0.2 μ a in any tube**	110	volts
Target Voltage †	60 to 100	volts
Dark Current $^{\Delta}$	0.2	μ a
Target Current (Highlight) $^{\blacksquare}$	0.4 to 0.5	μ a
Signal-Output Current: $\#$		
Peak.	0.2 to 0.3	μ a
Average	0.08 to 0.1	μ a

Average-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight)	15	ft-c
Maximum Target Voltage required to produce dark current of 0.02 μ a in any tube**	60	volts
Target Voltage †	30 to 50	volts
Dark Current.	0.02	μ a
Target Current (Highlight) $^{\blacksquare}$	0.3 to 0.4	μ a

$\diamond$, *, $\square$, $\circ$, $\oplus$, **, $\dagger$, Δ , $\blacksquare$, $\#$: See next page.



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VIDICON

Signal-Output Current:*

Peak. 0.3 to 0.4 μ aAverage 0.1 to 0.2 μ a*Minimum-Lag Operation for Film Pickup*

Faceplate Illumination (Highlight). 100 ft-c

Maximum Target Voltage required to
produce dark current of 0.004 μ a
in any tube**

30 volts

Target Voltage† 15 to 25 volts

Dark Current. 0.004 μ aTarget Current (Highlight)‡ 0.3 to 0.4 μ a

Signal-Output Current:*

Peak. 0.3 to 0.4 μ aAverage 0.1 to 0.2 μ a

↓ This capacitance, which effectively is the output impedance of the 7263, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

* Beam focus is obtained by combined effect of grid-No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gaussess.

□ Definition, focus uniformity, and picture quality decrease with decreasing grid-No.4 and grid-No.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.

● With no blanking voltage on grid No.1.

○ Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

● The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.

** The target voltage for each 7263 must be adjusted to that value which gives the desired operating dark current.

† Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.

▲ The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.

■ Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.

* Defined as the component of the target current after the dark-current component has been subtracted.

SPECIAL PERFORMANCE DATA

In connection with the following tests, sample 7263's will maintain resolution as determined with a RETMA Resolution Chart, or equivalent, and will faithfully reproduce all resolution wedges and grey scales of the chart.

Vibration Tests:

These tests are performed under conditions for *Average-Sensitivity Operation for Live-Scene Pickup* on a sample lot



VIDICON

of tubes from each production run. Tubes and their associated components§ are vibrated on apparatus providing dynamic conditions similar to those described in MIL-E-5272B♦, paragraph 4.7.1.

Resonance. Tubes and associated components§ are vibrated (per the method of MIL-E-5272B♦, paragraph 4.7.1.1) for 1 hour at +25° C, for 15 minutes at 0° C, and for 15 minutes at +55° C.

Cycling. Tubes and associated components§ are vibrated (per the method of MIL-E-5272B♦, paragraph 4.7.1.2 pertaining to specimen without vibration isolators) for 1 hour at +25° C, for 15 minutes at 0° C, and for 15 minutes at +55° C.

Temperature-Pressure (Altitude) Tests:

Tubes and associated components§ are subjected (per the method of MIL-E-5400* paragraph 3.2.20, 3.2.20.1, and 3.2.20.1.1) to the separate and combined effects of varying temperature 0° to +55° C and varying barometric pressure 30 to 3.4 inches of mercury. The pressures correspond to sea level and to an altitude of 50,000 feet, respectively.

Shock Tests:

These tests are performed with no voltages applied and on a sample lot of tubes from each production run. Tubes and their associated components§ are subjected in these tests (per MIL-E-5400*, paragraph 3.2.21.2.1) to 18 impact shocks of 15 g consisting of 3 shocks in opposite directions along each of three mutually perpendicular axes of the tube. Each shock impulse has a duration of 11 ± 1 milliseconds with a maximum impact acceleration occurring at approximately 5.5 milliseconds.

Temperature-Humidity Tests:

These tests are performed with no voltages applied to the 7263. The 7263 and associated components§ are subjected (per the method of MIL-E-5400*, paragraph 3.2.20.2B) to relative humidities up to and including 100 per cent at temperatures up to and including +50° C.

§ Tube socket such as Cinch No. 54A18088 and RCA Assembly No. 200SDU501, or equivalent, which consists of the deflecting coils, focusing coil, alignment coil, shield, and target connector.

♦ 5 June 1957, Procedure I of Military Specification.

* 1 January 1956.

OPERATING CONSIDERATIONS

The *target connection* is made by a suitable spring contact bearing against the edge of the target flange. This spring contact may conveniently be provided as part of the focusing-coil design.

Support for the 7263 should be provided such that, under vibration and shock, the tube will not be displaced with respect

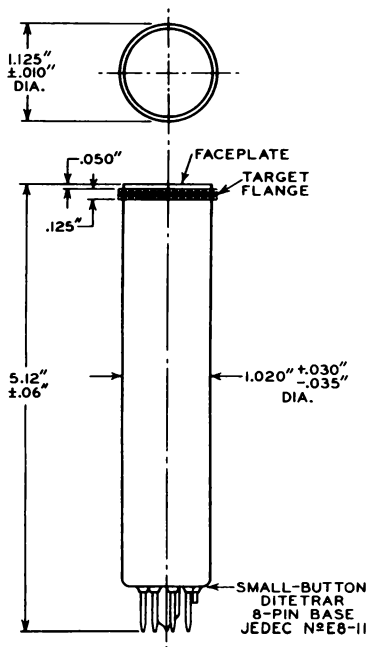


7263

VIDICON

7263

to the focusing, deflecting, and alignment fields. Suitable support is provided for the tube and its socket in the RCA Deflection Assembly 200SDU501, or equivalent. Orientation of the 7263 in its support should be such that the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.



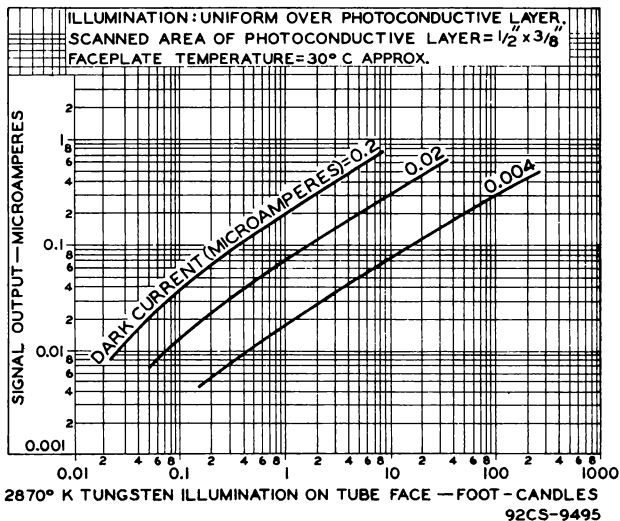
92CS-9885

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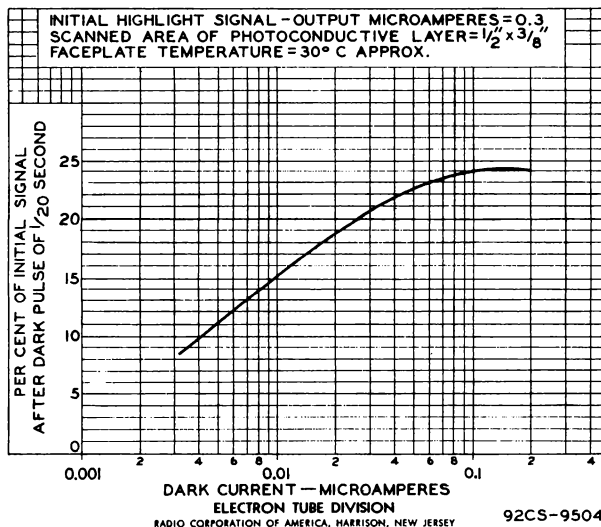


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TYPICAL LIGHT-TRANSFER CHARACTERISTICS



TYPICAL PERSISTENCE CHARACTERISTIC



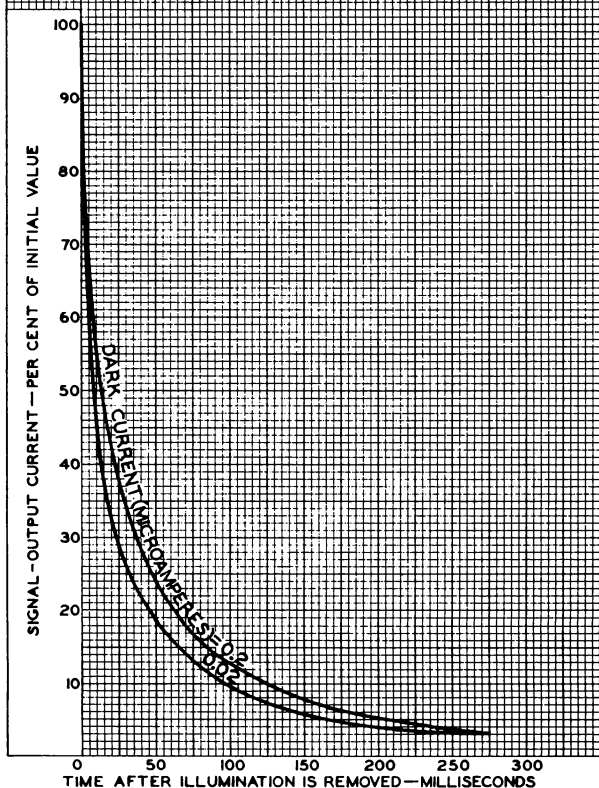


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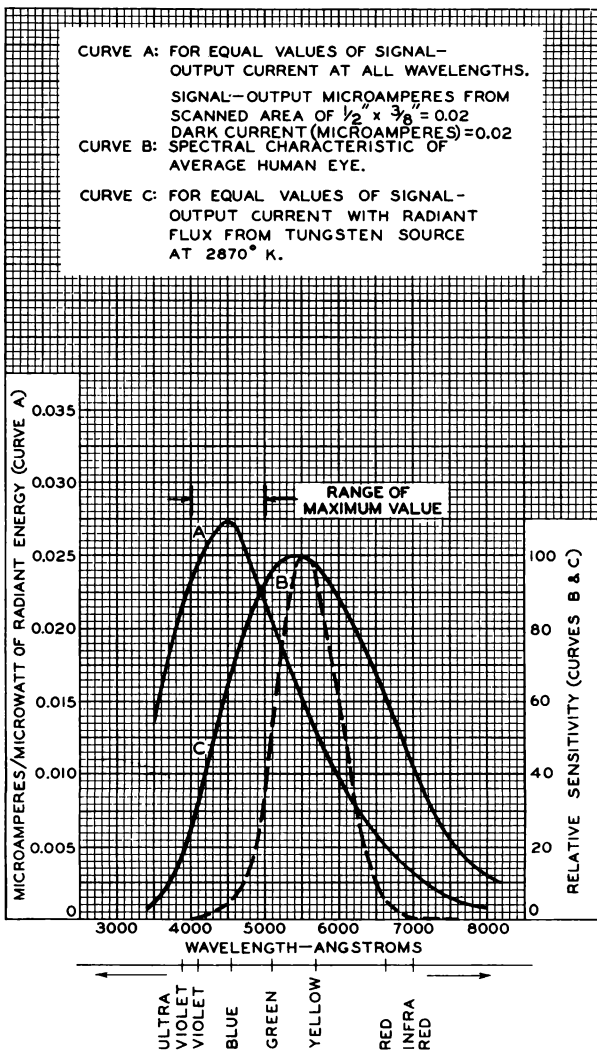
TYPICAL PERSISTENCE CHARACTERISTICS

INITIAL HIGHLIGHT SIGNAL-OUTPUT MICROAMPERES=0.3
SCANNED AREA OF PHOTOCONDUCTIVE LAYER= $\frac{1}{2}$ " x $\frac{3}{8}$ "
FACEPLATE TEMPERATURE=30° C APPROX.





SPECTRAL-SENSITIVITY CHARACTERISTICS



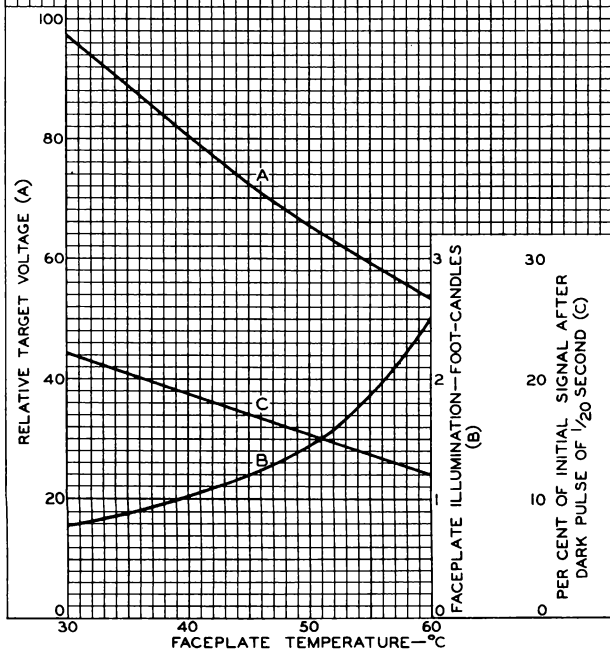


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TYPICAL CHARACTERISTICS

HIGHLIGHT SIGNAL - OUTPUT MICROAMPERES = 0.2
DARK CURRENT (MICROAMPERES) = 0.2
SCANNED AREA OF PHOTOCONDUCTIVE LAYER = $\frac{1}{2} \times \frac{3}{8}$ "
CURVE A: RELATIVE TARGET VOLTAGE REQUIRED
TO MAINTAIN DARK CURRENT OF $0.2 \mu\text{A}$.
CURVE B: 2870° K INCANDESCENT ILLUMINATION
REQUIRED TO PRODUCE SIGNAL-OUTPUT
CURRENT OF $0.2 \mu\text{A}$.
CURVE C: PERSISTENCE (LAG) CHARACTERISTIC
FOR AN INITIAL SIGNAL-OUTPUT CURRENT
OF $0.2 \mu\text{A}$.

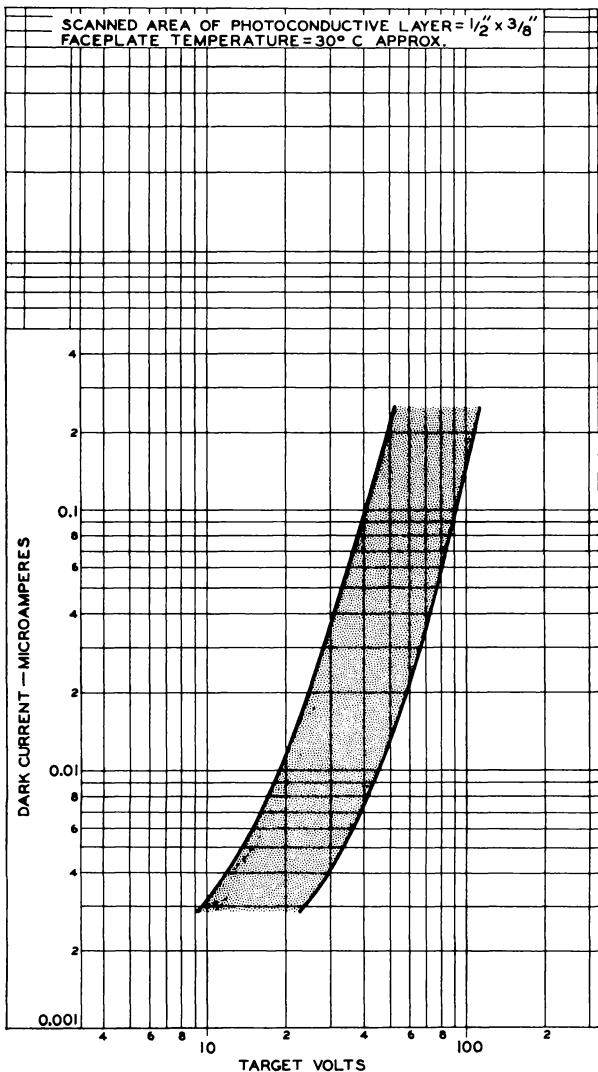


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DARK-CURRENT RANGE



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

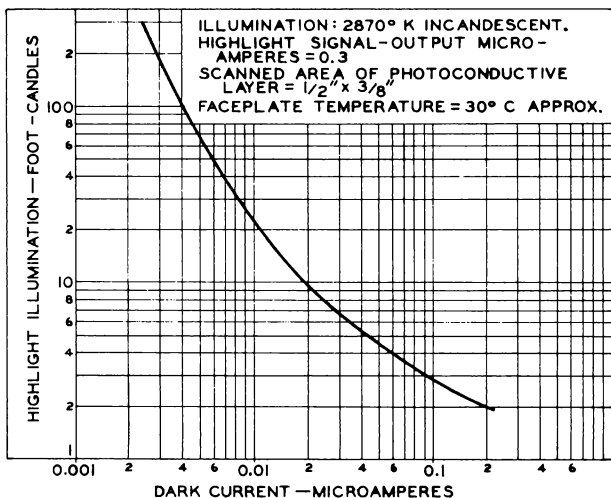
92CM-9497



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TYPICAL CHARACTERISTIC



92CS-9493